The
Electrical Review

VOL. CXIII. SEPTEMBER 29, 1933 No. 2914.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

THE ELECTRICAL REVIEW, DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1.

Telegraphic Address: "AGEEKAY, WATLOO, LONDON." Code, A B C. Telephone No.: Hop 3333 (50 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades and has by far the largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d. Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to ELECTRICAL REVIEW, LTD., and crossed "Lloyds Bank."

For List of Foreign Agents for the ELECTRICAL REVIEW see Advertisement Supplement.

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What Next?

WITH the appointment of the new Council of the British Electrical Development Association we have closed the first chapter of a new book of the electrical industry. Let us not be under any delusions; it is only the end of a chapter, not the end of the book.

The second chapter is at the present moment being written; it should be more rapidly produced than the first, must be a record of new and more strenuous work, and exhibit the practical application of ideas which have, in the chapter-one period, overwhelmed us with talk in many quarters.

With the new Council in being and its leaders and other chief officials duly installed in office, we must leave a lot of things behind us, and in a better atmosphere set our minds and hands definitely in pursuit of our great objective—the complete electrification of Britain. All the proposals that have been advanced should be examined, and only those worthy of serious consideration should be included in the first plan of operations; fads and fancies, freaks and follies must not be allowed to clog the wheels and hamper us.

Men of experience, originality and enterprise will find abundant opportunity to make good use of these qualifications. Perhaps they will give us a programme—if not they may soon have one submitted to them; anybody who has closely studied the subject could compile a practical one from the pages of the ELECTRICAL REVIEW in a very short space of time.

Let us leave this matter there at this particular moment, while chapter two writes itself, and see whether with the reorganisation of E.D.A. and its consequent activities we have reached finality in the work of reconstruction. From ideas that are placed before us from time to time we know that there are amongst us those who feel that other important matters affecting the future control of electricity supply require attention.

The searchlight has been turned upon both the Electricity Commission and the Central Electricity Board. If there are weaknesses in their constitutions these should be eliminated so that the whole controlling machinery may become as perfect as human effort can make it. Is all well with the Commission and its personnel? Does it keep itself too much to itself? Does the industry, and not only the industry but the nation generally, know enough about it, its members, its operations, its personnel and changes therein, and its cost? Has a stage been reached when the electricity supply industry should seriously consider whether it needs both a Commission and a Board, with separate offices and separate organisations? Has not the time arrived when it might be advantageous if both came under one definite chief? Should that chief be technical or should he be a big man of affairs?

We are co-ordinating and unifying the supply of electricity; is it not possible that we could carry on more effectively and more efficiently if we applied those vital principles in the government of the supply industry as well as in the generation and distribution of electricity?

Too Many Authorities?

SOME men who are interested in public affairs which bring them face to face with electrical matters confess to being puzzled by the complexity of electricity supply organisation; they find it difficult to understand why there need be so many different authorities when we are working to a more or less national plan. We fully recognise that questions such as these may give rise to others asking whether it is desirable for operations that are now free from Government influence to be brought within its entanglements, and whether new legislation to make the change effective is likely to meet with approval inside the industry. These are quite good subjects for discussion. We do not shudder at the thought of new legislation if it is necessary for the complete development of electricity.

There is talk of distribution measures which may call for the attention of Parliament, but new legislation need not be limited to these if it is for the general advantage. We refer to these matters now purely for the purpose of stimulating thought and discussion.

Rural Water Supplies

THE problem of providing water in rural areas, which was discussed in our leader of September 15th, should not be dismissed because the drought that focused attention on it has ended. Dr. H. J. Denham informs us that a technical report on the subject by the Institute of Research at Oxford University, of which he is director, will be issued in the near future; we may expect it to contain useful practical data on automatic electric pumps. Writing to the *Times*, Mr. J. W. Meares says that women in England have sometimes to haul buckets from wells 200 ft. deep, but that in India small electric pumps are in common use. Dr. A. P. Thurston takes exception to the assumption made by Mr. Meares that a "water-grid" is financially impracticable, and refers to a report now being prepared by the Institution of Mechanical Engineers at the instance of its president, Mr. A. E. L. Chorlton, M.P. This committee would considerably enhance the utility of its findings if its terms of reference permitted a comparison to be drawn between the different proposals.

The I.E.E. Meetings

TRANSMISSION and distribution matters will furnish subjects for most of the meetings of the Institution of Electrical Engineers during the first half of the next session. Mr. P. V. Hunter will deliver his presidential address on October 26th; he is so closely associated with electrical transmission, and h.v. cables are in so interesting a stage of technical development, that we may expect him to express opinions of considerable value on the subject. A fortnight later Mr. C. W. Marshall will read an especially timely paper on the lower-voltage sections of the grid, the importance of which has hitherto been obscured by the attention given to the primary 132-kV system. So much progress has taken place recently in automatic voltage and switch control that the paper by Messrs. W. Kidd and J. L. Carr on its application to distribution networks should yield some useful matter. Travelling waves always provide a fascinating subject, and the influence on these of associated apparatus, which Mr. J. L. Miller is to discuss, has a very marked practical aspect. A kindred subject is the Electrical Research Association report on telephone interference to be presented by Messrs. W. G. Radley and S. Whitehead, and information regarding the latest stage in development of the controlled-grid rectifier may be expected from Mr. H. Rissik when he deals with d.c. high-voltage transmission.

How to Speak

WE presume it is owing to the popularity of last winter's competition that E.D.A. has adopted "The Art of Public Speaking" as the subject of three evening conferences (7.30 o'clock) to be held at the Caxton Hall between now and Christmas. These "instruction lectures" will be delivered on October 25th, November 22nd, and December 20th, by Mr. E. Stone. Doubtless they will deal with electricity in a specialised way, and we hope that many members of the staffs of electricity undertakings will be attracted. There ought to be an eagerness among such just now to learn how to talk attractively and convincingly to the householder and how to give effective demonstration lectures in showrooms and at exhibitions.

Go-ahead Halifax

SIR JOHN BROOKE, the vice-chairman of the Electricity Commission, visited Halifax last week to open an electrical exhibition organised by the Corporation Electricity Department. He delivered a very effective speech on the importance of providing cheap electricity. It was a matter for congratulation that during the years of depression Britain had been leading the rest of the world in the rate of advance in electricity consumption. Though we had our depressed industries, "other uses," and particularly domestic, had continuously increased the use of electricity. Halifax itself had beaten the national average advance, in spite of the fact that building there was relatively stable and free from the mushroom growths noticeable in some areas. The Halifax sale of electricity had increased without any material addition to the potential consumers. Sir John paid a tribute to Mr. E. A. Mills, the electrical engineer and manager, describing him as a "first-rate engineer" and a "very sound commercial manager." In commending the committee for its enterprising methods—Mr. Mills has just recommended an all-round reduction in charges—Sir John remarked upon the great field which exists under modern conditions for catering for people who want electricity for purposes outside the ordinary run.

A Gas Man's Plaint

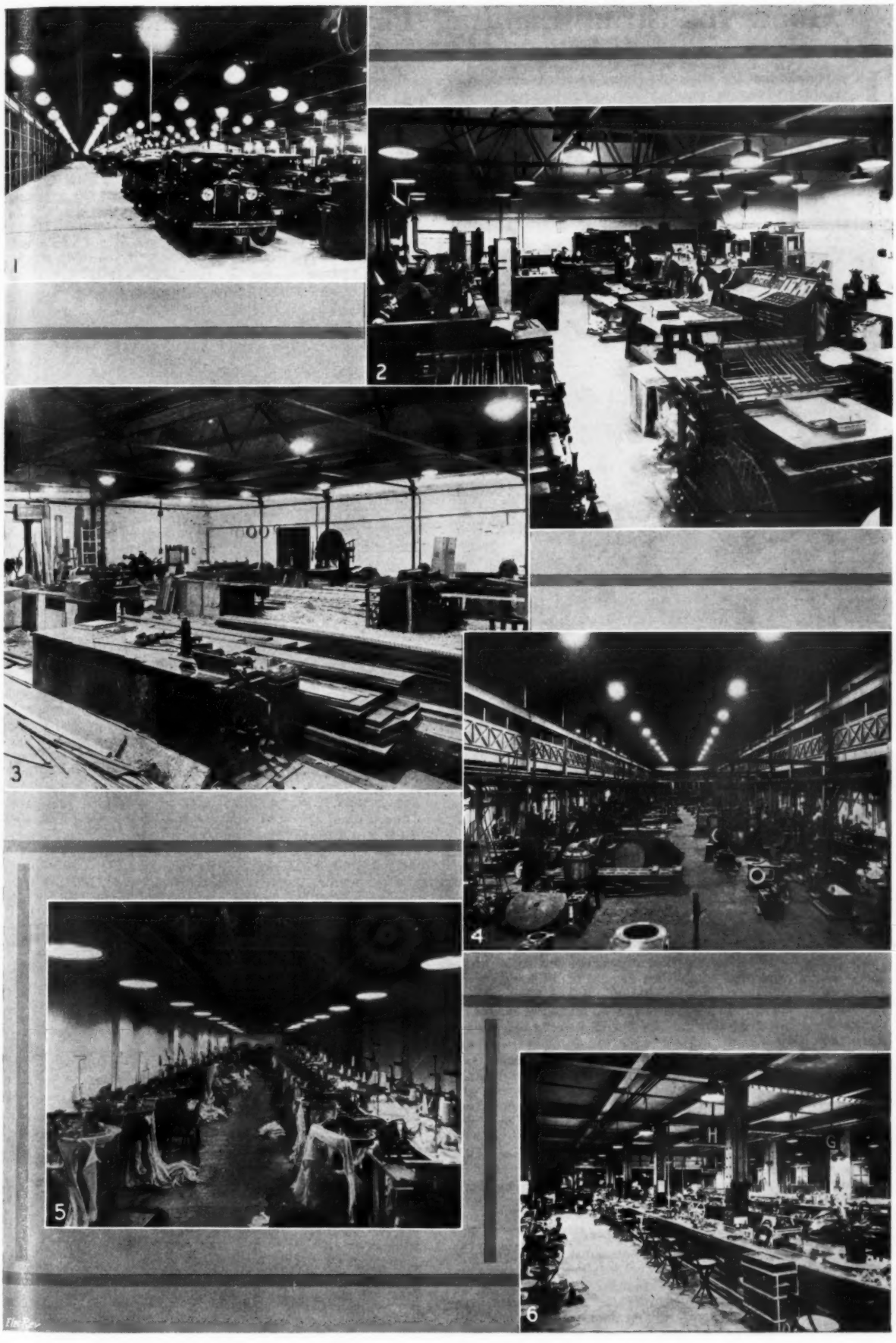
AT a recent meeting of gas engineers and managers Mr. D. A. Pratt (York) expressed his concern at the headway which electricity was making at the expense of gas, and he was not without justification. But once again he referred to the support given to the industry willy-nilly by the taxpayer. It is about time that this fairy tale was scotched. So far from adding to the burden of taxation, the industry is actually paying more than its share, due to the depredation of the local authorities for their rate funds. Mr. Pratt wants the gas industry to copy electrical methods. He mentioned in his paper the "enthusiasm and determination" of electrical people, and made particular reference to the Electrical Association for Women. Why not, he asked, a Women's Gas Association? Does he really think that ladies could be persuaded to join a body with such an ambiguous title?

The "Inevitable March"?

WE do not often receive support from gas engineers for our editorial views, but the manager of an important gas undertaking has within the past few days endorsed our view that the all-mains wireless set is the "greatest ally" of the electrical industry, as once a set is introduced in a home points for other uses quickly follow in every room. Last year the output of gas decreased by 1.4 per cent., compared with an increase in the output of electricity of 7.1 per cent. The gas industry is not taking this lying down. The Gas Light and Coke Co. has taken the eminently practical step of offering a block-rate tariff to its industrial consumers giving considerable reductions for large consumptions. This may not affect the motive power position, but it will make it all the more necessary for electricity supply undertakings to retain engineers who are experts in industrial heating problems, if we are to gain on the swings as well as on the roundabouts.

Fear of E.D.A.

The general committee of the British Commercial Gas Association at its conference at Bournemouth has directed attention to our contemplated intensive electrical propaganda and has asked gas-men to provide increased funds for combating it. Sir Francis Goodenough urged the need of increased advertising of the gas industry. He said that to think of advertising as a regrettable expense was to misunderstand its function and its power altogether. Sound advertising—educative, informative, and reliable—was needed to-day more than ever for the building up and maintenance of sound business. These might very well have been the words of the editor of the ELECTRICAL REVIEW in addressing the new E.D.A. Council! Let us come down off our pedestal.



Good Lighting in a Variety of Industrial Establishments (see next page)

1. The Austin service station, Birmingham. 2. A composing and printing works. 3. A woodworking shop. 4. A machine shop at Messrs. Belliss & Morcom's works. 5. In an underwear factory. 6. The dashboard assembly shop at the Lucas works, Birmingham

Good Industrial Lighting Pays. By D. Spencer-Johns

Fewer accidents: Increased production

IT is curious that the artificial lighting system is almost the last thing to receive consideration among the amenities of factories and other industrial buildings, and there are very few such buildings in this country to-day in which the lighting could not be bettered, with a resultant decrease in avoidable accidents, an increase of output, and a considerable improvement in the conditions under which operatives are employed. A definite general figure representing the proportion of work carried out under conditions other than unaided daylight cannot be computed, because of the diversity of the

Lighting in a cooker-assembly works

factors which must receive consideration. It may be assumed, however, that normally from seven to eight hours in every hundred would represent a minimum figure. Statistics have shown that, after the time when daylight is supplanted by artificial light, there is a considerable slackening-off in the rate of production with a noticeable increase in the accident rate.

Either of these factors is sufficiently important to warrant the serious attention of factory executives; taken in conjunction it should be necessary merely to bring them to the notice of those concerned to ensure prompt action. Again, it is difficult to offer any general computation of the rate by which production would increase under modernised conditions, but the following case can be vouched for. A works in which the intensity of illumination was increased from the totally inadequate figure of 4½ ft.-candles to the recommended figure of 12 ft.-candles showed an increase in production of 15 per cent. over the period of observation. The possibility of decreasing the accident rate by giving proper consideration to the artificial lighting system is established beyond doubt by a survey made by an eminent insurance corporation. This survey showed that the number of accidents in industrial plants increased steadily from July to December, attaining a figure no less than 88 per cent. in excess of the summer rate, and decreased again steadily as daylight hours lengthened.

These figures show that the case for improved lighting conditions has its economic as well as its æsthetic aspect. An industrial plant operating at a maximum output throughout the whole of the day obviously has an advantage over one whose production rate slackens off with the decline of daylight; it pays better dividends to its shareholders because it obtains better results from its more contented staff, while reducing waste to a minimum and ensuring that plant and machinery function at maximum speed.

Effects upon Employés

The frequent occurrence of accidents must have an adverse effect upon the operatives. The worker who has seen his associates injured acquires a sub-conscious sense of resentment and takes extreme measures to ensure the safety of his own person. A man who is constantly on the alert to avoid sources of potential injury cannot possibly work at so high an efficiency as one with no such mental reactions. The inevitable result is that undue caution militates against complete efficiency, not only in the evening but during the whole of the day. Modern methods of production are such that a reduction in the efficiency of any one unit, whether it be an individual or a whole department, must tend to retard the entire industrial machine of which it forms a component. In such a case, would not the tendency be to expand the plant or to increase the personnel in the lagging section? Such a course could only involve an expenditure equal to, if not in excess of, the amount which would be involved by the provision of proper lighting conditions.

There are a number of organisations carrying out research work and circulating propaganda concerning these factors, among which the Factory Department of the Home Office does excellent work, but initial prevention or treatment at inception are the only satisfactory courses; once a mental attitude is created, its eradication becomes increasingly difficult with the passage of time.

Properly Planned Installations

Proper illumination is by no means synonymous with an abundance of light. The correctly planned lighting system furnishes a maximum intensity where it is most required, distributing the light flux equitably over the working plane and lighting gangways, storage areas and back-alleys to a lower intensity; this it does for an economic connected load. It is devoid of glare and so arranged in relation to the plant that dense shadows on working surfaces or on the moving parts of machinery are avoided, while specular reflection (*i.e.*, the reflection of light sources in polished parts of machinery) is reduced to a minimum.

The human eye is comparable to a camera in the sense that the lens (or pupil) causes, by refraction, to impinge on the film (or retina) a reproduction of the objects in the field of view. As in the case of a camera inadequate light necessitates a time exposure, so, in the case of the human eye, the process of seeing takes relatively longer under poor lighting conditions. To carry the analogy farther, the presence of a bright source of light in the field of view irritates the optic nerves and militates against acuity of vision just as, in the case of the camera, it destroys the negative and precludes a successful exposure.

The intensity of illumination over any specific area will naturally depend upon the character of the work carried out in that area. Very high-grade precision work obviously calls for high intensity lighting, while for less detailed processes a lower intensity can be employed without adverse effect; dark materials, because of their lower reflection factor, require more light than light materials to attain the same apparent brightness. A concise and eminently useful booklet is issued by the Lighting Service Bureau in which the majority of operations are classified with minimum and recommended intensities, while among the more eminent manufacturers of industrial lighting apparatus are firms which retain staffs of trained illuminating engineers for consultation by potential users of their apparatus.

When works executives can be made to realise the importance of providing properly planned lighting systems of ade-

Part of Messrs. Harris's bacon factory, Calne, Wilts

quate intensity, there should be very few among the installations now in existence left unaltered. We should be within measurable distance of a boom in the electrical industry if only a small proportion of the installations which so badly need improvement were modernised, not only in industry but in almost every application of artificial lighting.

A Scheme to Floodlight London. By G. B. J. Athoe, F.R.S.A.

An architect's views

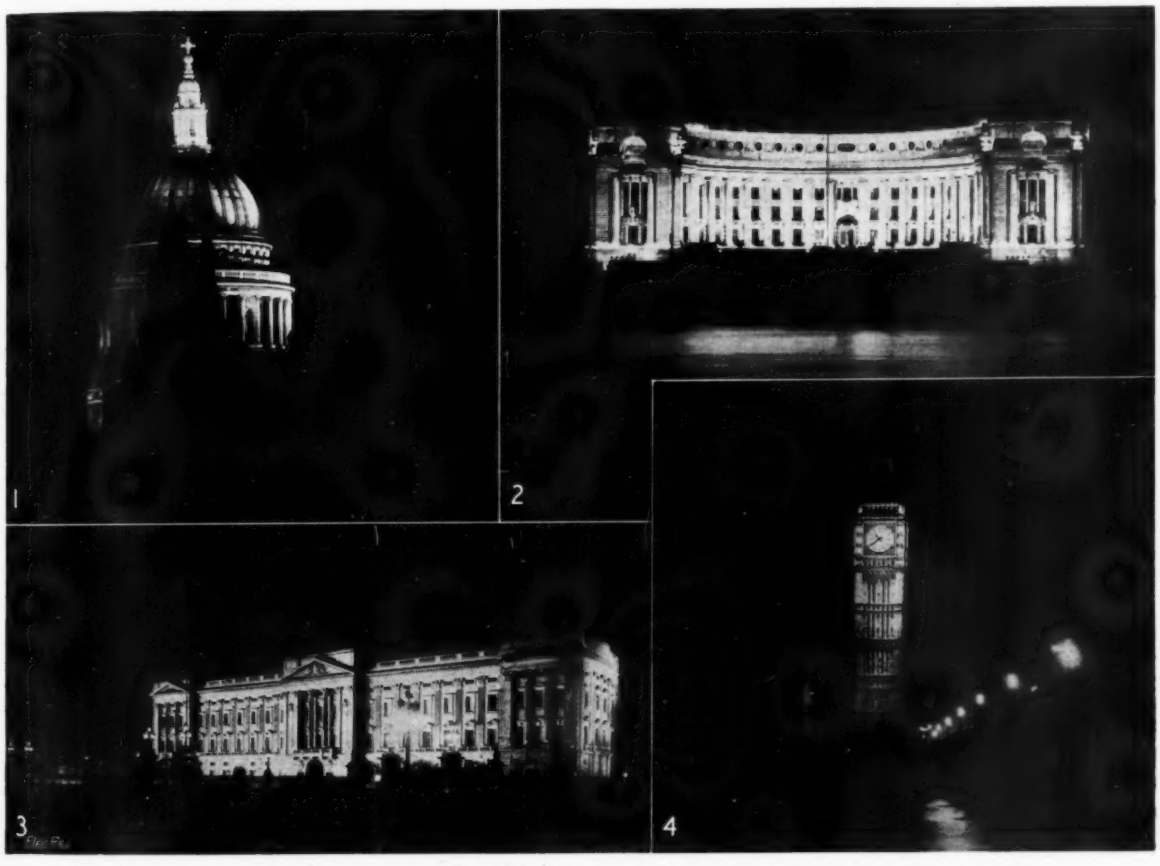
TO me it was good news when I heard that the London Society had decided to sponsor a scheme for the occasional floodlighting of some prominent buildings in London, because it followed on a scheme which I advocated publicly so long ago as the autumn of 1930, when I had just returned from Vienna and Budapest, to which a party of members of the Incorporated Association of Architects and Surveyors had paid a visit.

On my return I noted in my public diary: "The majority of the business buildings in Budapest, though beautiful from the architectural standpoint, are spoiled by the shop-fittings and, more particularly, by hideous signs. The lettering on most of these is execrable. . . . For instance, I noticed at one circus that four striking buildings were thrown out of perspective by the indiscriminate use of illuminated signs, so that an otherwise pleasing combination was spoiled.

"I must, however, congratulate the city engineer or whoever was responsible for the manner in which floodlighting has been used to illuminate important and historic buildings. The effects at Budapest far surpass those at Vienna or Brussels, and I commend them to the notice of our local government authorities now that a Brighter London is a topic of discussion. . . . The only example in London of which I can think at the moment is that to be observed on the façade of the London Electric Railway Building, St. James's Park, as seen from the Mall near the spot where the bridge cuts across the lake. May I express a pious hope that the Institution of Electrical Engineers will take up the idea and carry it a stage farther? No doubt someone or other would grumble at the cost. Everyone seems to enjoy cheaper current than we do!"

Now things have come to a head. The occasional floodlighting of some prominent buildings in London may be seen in the near future, for a plan is being discussed for the installation of permanent equipment at selected places. Some months ago the project was discussed by the London Society. Members were circularised, and there was a general opinion in favour of a limited scheme of floodlighting. A conference of all the interested bodies was to have been called to consider the financial aspect of the matter, but it is understood that the sum required to defray the cost of the wiring and equipment will be provided privately.

Suggested buildings to be illuminated are the National Gallery, the Clock Tower of the Houses of Parliament, Westminster Abbey, and Somerset House. All these were floodlighted during the Lighting Congress in 1931, and similar treatment on special occasions would, it is thought, meet with widespread approval. There is no intention of making the floodlighting a permanent nightly feature of London life, but once the wiring has been completed and the lamps provided—the expensive part of the undertaking, for the cost of the illuminant is not great—the lighting could be switched on as occasion demanded.



Notable London buildings which were floodlighted for the International Illumination Congress, 1931

1. St. Paul's Cathedral from Ludgate Hill. 2. The London County Hall. 3. Buckingham Palace. 4. The Clock Tower of the Houses of Parliament ("Big Ben")

Many sculptors are not in favour of the floodlighting of statuary. It is pointed out that when figures are illuminated from below wrong shadows are cast. This objection does not apply to buildings.

Diesel-electric Shunting

EXPERIENCE on railways and in large industrial works shows that the number of Diesel-electric locomotives required for shunting is smaller than the number of steam locomotives where more than two are normally employed. Sir W. G. Armstrong Whitworth & Co., Ltd., who have developed the "A.B.E." transmission system with two moving parts only, give the following as typical examples of comparative working costs in pence per hour for daily duties of 8½, 16 and 24 hours. The corresponding weights of the locomotives were 18, 30, and 35 tons for steam and 15, 25, and 30 tons for oil; the costs of coal per ton, delivered, were 18s., 18s., and 16s. 6d. and of fuel oil in tank 4½d. per gal. The cost of water per 1,000 gal. was 1s., 2s., and 6d. respectively. One engineman was employed in each case, except for the heaviest steam locomotive, which required two men.

Duty.	Type of Locomotive. Steam. Light.	Diesel. Light.	Steam. Average.	Diesel. Average.	Steam. Heavy.	Diesel. Heavy.
Fuel	11.7	2.2	29.4	7.9	31.6	14.8
Lubricants	0.7	0.5	0.7	1.8	0.6	3.5
Water	0.7	—	4.6	—	1.4	—
Repairs and maintenance...	8.7	8.2	7.5	7.0	8.0	7.3
Wages	23.4	18.0	22.0	18.0	30.9	18.0
	45.2	28.9	64.2	34.7	72.5	43.6

Radio Relay Systems. By "Relay Engineer"

THE past five or six years have seen wireless relay services put into operation in many towns and districts in the United Kingdom until there are now about three hundred establishments operating under local concessions bestowing powers for varying periods of years, many of them enjoying monopolies in this respect. A large amount of capital has been sunk in the business, and generally speaking practice is becoming standardised.

In most localities the established radio and electrical firms are content to allow an outside company to secure a valuable concession from the local council with no further notice taken beyond a feeble protest that is foredoomed to failure. As one who has studied relay services in this country and abroad —where they have been in use for the past ten years and are rapidly extending their scope—I would strongly urge local electrical firms to get together and secure concessions to erect and operate relay services themselves. There is a mistaken idea abroad that relay services must be definitely detrimental to the established radio business, but the fact is that the two are quite distinct and will be found to be complementary.

All other things being equal, a company that is locally financed and operated should receive preference in the matter of the concession from the local authority: the greatest "pull" that the outside company possesses is the fact that it can point to several more or less satisfactory installations already in operation, whereas the local company does not possess this experience and must start from the ground up.

As one who has been connected with the formation of a local company I hope that these notes may assist others to initiate their own relay services. The local radio dealer is the man most likely to be adversely affected by the establishment of a relay service in his locality, and as this service is bound to come along sooner or later it is only equitable that he should be financially concerned with the new scheme. The necessary decision must be taken soon, as some of the larger relay companies are already sprawling octopus-like across the country and gathering up concessions wherever they can profitably do so.

A complete relay station in a South Coast town providing dual programmes for 2,000 loud speakers in six groups. Provision is made for a third programme if this is required in future

Relay services are only about ten per cent. radio, and ninety per cent. engineering, as the efficient erection of the overhead and other lines is half the battle for success. Purely radio firms do not usually possess sufficient experience in this class of work, and the inclusion of a firm with overhead line experience will be invaluable to the new company.

How to Proceed

The company should only be tentatively formed at first, as it would obviously be unwise to incur considerable expense in this direction until the necessary concession has been obtained from the local council. At the same time, it must not be too nebulous, although most of the haggling with the town clerk will be carried out by the company's solicitors. The directors should be men of local standing, if possible, in order to enable invisible wires to be pulled when and as required during the protracted and delicate negotiations that are bound to ensue before the concession is finally secured. Avoid keeping to one side of the council, as if this is done the other side will oppose by all means in their power as a matter of principle.

The first step is to approach the local council, through the town clerk, for a concession to erect and operate a wireless relay service throughout the borough, asking for a monopoly for this service for a number of years—usually ten, the concession to be extended indefinitely beyond this period subject to cancellation by either side at six months' notice. The agreement will probably embody many clauses already incorporated in the Postmaster-General's licence to operate, but in my opinion the essential clauses would cover (1) monopoly, (2) the crossing of streets without previous reference to the council, (3) omnibus wayleaves over all corporation housing estates and property, and (4) the minimum possible payment in return. As regards the last point, payment in return for the concession varies widely in different localities, taking the form of a simple percentage on subscribers' rentals, or a fixed annual sum per subscriber. The most favourable that I have any knowledge of—and which my own company enjoys in return for a ten years' monopoly and free wayleaves over all corporation property—is the payment to the corporation of 5 per cent. on subscribers' payments in respect of services only, and excluding any payments in respect of loud-speaker hire, hire-purchase or purchase. The most unfavourable that I have heard of is 10 per cent. of *all* payments received by the company in the first year, rising to 15 per cent. in the second year, and thereafter to 20 per cent.; a minimum payment of £100 in the first year, rising ultimately to £500 per annum. This concession also exacts the sum of 1s. for every *fixing* to corporation property, and requires the consent of the tenant to be secured in addition to that of the local authority.

The Most Equitable Arrangement

I consider the payment of a small percentage, not exceeding 7½ per cent., on subscribers' rentals for service to be the most equitable, as against a fixed sum per subscriber (ranging from 6d. to 2s. 6d. per subscriber per annum, with or without fixed minimum payments), as if the company should desire at any time to reduce rentals it can do so without penalising itself in respect of payments to the corporation. Payments in respect of loud speakers, &c., will tend to the utilisation of cheap apparatus to the ultimate detriment of the service.

Concessions will vary in detail in practically every case, and will represent, like all agreements, a certain amount of give and take. Make sure, therefore, that you ask for plenty in the first place, and much show of sacrifices can then be made to secure the really important needs. The corporation will almost certainly demand, with reason, complete indemnity regarding all claims that may be made against it resulting from the institution of a relay service, and in addition to this may insist upon a joint insurance policy to this effect.

As regards point number (2) above, attempt by all means in your power to obtain permission to cross streets following *verbal*, or short correspondence, agreement with the borough engineer as regards heights of lines, &c., subject to confirmation by the council later.

If permission has to be obtained before crossings can be made and the council—or the particular committee concerned —only meets monthly, then progress will be very slow at first and the delays intolerable. Some councils permit the relay company to cross a street once only, and this may prove very awkward in practice. Point number (3) gives an immediate field for initiating the service.

The concession having been obtained after probably several months of intensive work and argument, assisted by a little local influence, it will be necessary to obtain a licence to operate the system from the Postmaster-General. This licence, costing £1 annually, contains more restrictions than permissions, and its clauses prevent the initiation of any programmes by the relay company itself, including gramophone records or the use of a microphone for announcements; the latter is sometimes used by a few companies in defiance of the regulations of the P.M.G., but the risk of cancellation of the licence does not make the infringement worth while. The P.M.G. will require a log-book of receptions and retransmissions to be kept, exercises the right to prohibit reception from certain Continental stations, will otherwise permit any radio programme to be relayed, and finally reserves the right to take over the service lock, stock, and barrel on what are called "tramway terms" in the year 1936.

A copy of this licence can be obtained from the Secretary, G.P.O., London, E.C. All apparatus used in the station must be to a pattern approved by the Postmaster-General, and there are certain requirements as regards lines, &c., that will be watched with an eagle eye by the local engineer.

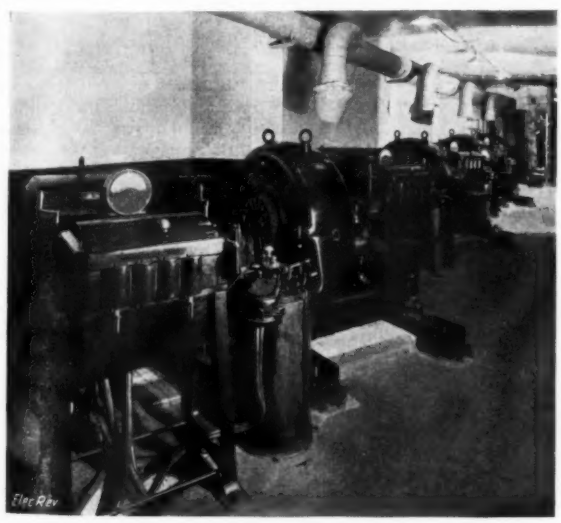
The formation of the company should present no serious difficulty, except, possibly, the gathering together of sufficient capital from amongst the traders concerned. It may therefore be necessary to bring in a certain number of outside shareholders, and there is usually no lack of money available. Assuming the population of the town to be from 50,000 to 70,000, about £3,000 will be required, although the authorised capital should be £5,000. About £2,000 will be required in the first year if the job is to be tackled properly.

The appointment of directors will need careful consideration, and I know of one ideal arrangement in this respect. The managing director of the relay company is also the managing director of the leading firm of electrical engineers in the district and is responsible for all line erections and other engineering matters, which he personally supervises. There are two other directors, one a leading radio dealer responsible for all publicity and programmes, the remaining director being an independent gentleman and responsible for wayleaves and kindred matters, of which he has some knowledge. The secretary of the company is connected with another electrical firm, and three shareholders are local radio men. The qualification of directors is 100 £1 shares held personally; no salaries should be payable the first year, as there will almost certainly be no profits available for this purpose.

Selecting Suitable Premises

With the company duly completed the next step is to secure convenient premises in a suitable part of the town—by no means a simple matter. The district in which the receivers are placed must be interference-free, and this usually means working from the outskirts of the town inwards—on the face of it an uneconomical arrangement. Good reception will, however, be the best selling point in districts subject to interference from trams, &c., and it is worth while incurring expense to ensure this.

Should it be necessary to get some way out of the town to obtain good reception the receivers only need be placed in this position, connection with the distributing and amplifying point being made by telephone lines. The Post Office is always willing to assist in this direction; the charge for a private line is approximately £8 per mile per annum, including maintenance. For a dual programme, the cost will therefore be £16 per mile per annum to connect the receiving point with the amplifying and distributing point, which is much cheaper than the company could do it. In most cases, however, the receivers and amplifiers can be situated at the same place.



The sub-station at the Gainsborough Studios, Islington **(See note on page 437)**

If possible, the receiving and distributing point should be near a corporation housing estate, if reasonably free from interference, as this will provide a ready market practically on the doorstep. If all the necessary wayleaves over corporation property have been secured, which, subject to safeguards, any reasonable corporation should grant to a local company performing a public service, work can be proceeded with in the first few months without the deadly delay of securing wayleaves. Should the corporation demur to wayleaves over its property on the score of unsightliness, a few members of the council should be taken to the site and shown the large number of "Heath Robinson" aerials that disfigure the landscape, mentioning that the service will eliminate these eyesores.

The receiving and amplifying apparatus should be entirely a.c. mains driven, and batteries eliminated if absolute reliability is desired. If d.c. only is available the capacity of the rotary convertor for 1,000 to 1,500 subscribers should be from 1.5 to 2 kVA in order to avoid extensions later. Several manufacturers of radio apparatus now cater for the relay market, and there will be no lack of offers of apparatus to meet the requirements.

If two programmes are being relayed, which is practically essential for successful working these days, three receivers will

A row of handsome fittings and wall brackets in the Masonic Peace Memorial designed and made by Messrs. Louis Dernier & Hamlyn, Ltd.

be needed, two in use and one as a stand-by. In the interests of standardisation and operation these should be identical, but this is not essential. Amplifiers are usually rated on a basis of one 50-W amplifier for every 200 to 250 subscribers; with two programmes two such amplifiers will be required for every 250 subscribers. A spare should be kept ready for instant operation in the event of failure of the working amplifiers.

Diversity factor should not be taken into account, or the amplifiers loaded up to 400 loud speakers, trusting that only about half will be in on that programme, as if there is anything special on the No. 1 programme all the subscribers will be on this line. During such items it may be desirable to parallel all amplifiers to the one side and shut down the alternative programme.

At least one well-known manufacturing firm turns out special equipment for switching over any receiver to any amplifier, and any single amplifier or amplifiers in parallel to any group of subscribers, and I would strongly recommend that this standard apparatus be installed. For many reasons—one being the avoidance of cross-talk—it is advisable to purchase this gear in a complete state, manufactured by an experienced firm.

Do not buy equipment with the receivers built into it, but have them if possible self-contained and standing on top of the amplifier racks and distribution boards. This enables them to be changed without dismantling a lot of gear—there is very little time for this unless many spares are carried—and it is reasonable to assume that future development will be more rapid as regards receivers than as regards amplifiers. There is a certain sense of security in knowing that the receivers can be scrapped at any moment and replaced by a new type, even temporarily, for experimental purposes.

"Straight" Receivers Preferred

Violent controversy rages as to the type of receiver to be used, whether "straight" or "superhet." Straight a.c. receivers can be purchased with selectivity characteristics comparable to a superhet, and I consider them preferable on the score of quality of output and reliability. A relay receiver must get eight or ten stations really well, so that a good alternative is always available; it is not necessary to get the more distant stations, as reception from them will be too bad to inflict on listeners. We have found a decided preference for English programmes.

Amplifiers must, of course, be arranged on the unit system, enabling the station to be built up gradually as the service develops. Decide on a good make of amplifier and stick to it; do not have some of one make and some of another, or even all of one make but of different sizes, or serious operating difficulties will arise. Continuity of service demands standardised apparatus, so that quick changes can be made in emergency. A good standard size is the 50-W amplifier, giving an undistorted output of approximately 18 W, and ample for about 250 loud speakers. Larger amplifiers are liable to be run at a very poor load factor for a large portion of the day and are therefore not economical.

Timekeeping at Paddington

BY T. R. ROBINSON

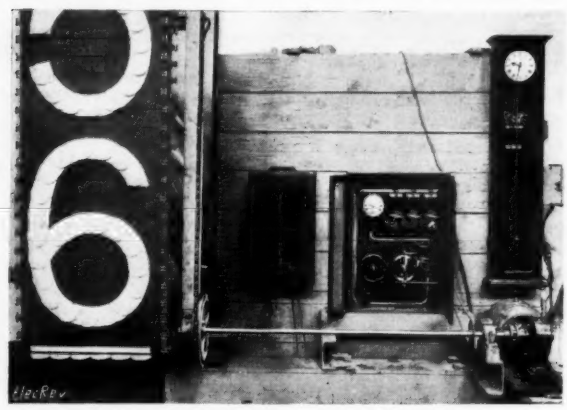
AN electrically operated clock of an unusual type, which is reminiscent of the popular " jumping figure " watches and clocks, has been erected at the end of the main arrival platform of the reconstructed Paddington Station, London, where it now forms part of an advertising sign. The hour and minute indications of this large " chronoscope," as it is called, are given by large white Arabic numerals in a rectangular frame, which are changed under the control of an electric master clock as each minute passes.

The mechanism for ensuring that the figures are changed at the right moment, and the time kept accurate, called for much special design, and one of the most remarkable features is the construction of the figure bands themselves. Each is made up of a number of sheet-steel slats, jointed at the corners by delta metal links to form an endless length. The links not only provide flexible joints between adjoining slats but also, by their engagement with the slotted driving sprockets, serve to transmit to the bands the movement necessary for the changing of the figures.

The figure-band changing mechanism is driven by a special type of slow-speed motor, running continuously at 700 r.p.m. The motor, acting through a totally enclosed worm reduction gear, rotates a shaft carrying a whittle-belt pulley, and from this, in turn, a heavy whittle belt transmits the drive to a second shaft, mounted parallel with and just behind those of the figure-band sprockets. The second shaft extends the full width of the three figure-band assemblies, and is fitted with three epicyclic gear units, by which its continuous rotation can be utilised at the right moments for moving the figure bands.

Ingenious Braking

Both the internal gear and the disc on which the planet gear studs are mounted run freely on the main spindle, and both have stout brake drums attached to them. A pair of externally contracting brake-shoes acts upon each of these drums, and springs acting upon the shoes hold those of the planet gear disc gripped to their drum. Those of the internal gear drum are held off by similar springs. Acting upon each pair of brake-shoes is a standard Marryatt & Scott brake magnet, and the windings of the two magnets are series



The master clock, control panel and driving mechanism

connected. While the magnets are inoperative the spring grip on the planet gear drum will hold it fast, while the freedom of the internal gear will allow of its revolving idly; but when the circuit through the magnets is closed their action is to overpower the springs and reverse the grip of the brake-shoes. The internal gear is then locked fast, while the planet gear drum is free to rotate, and drive the figure bands.

Each of the epicyclic gear units is identical in its action, and the control of the circuits of the magnets is by relays on a central panel. This panel has as its main feature a worm drive, operated by a light chain from the shaft driven by the motor, and the worm-wheel is constructed to complete one rotation in a few seconds less than one minute. Fitted to this wheel at diametrically opposite points are two stout spring strips, and on the panel at a suitable point is an electro-magnetically controlled trigger device, the release magnet of which is in circuit with the master clock. The rotation of the worm-wheel causes the spring strips to engage in turn with this trigger, and, as this will occur at intervals of slightly less than half a minute, the worm-wheel will be held by the locking of the spring strip until the master-clock impulse at the thirtieth second permits it to proceed.

The Paddington " chronoscope "

In order to prevent interference with the drive of the main spindle, the chain wheel on the end of the worm shaft of the control panel is fitted with a spring clutch, which allows of the chain wheel slipping around on the worm shaft when the spring catches are locked. By this means the worm-wheel is synchronised and released at true half-minute intervals.

Fixed to the rim of the worm-wheel is a steel pin, and once during each revolution of the wheel this pin rocks over a mercury-tube switch. This completes for a few seconds a 6-V circuit and energises the " make " solenoid of a relay switch located at the top of the control panel. The switch is fitted with two of these solenoids, one for closing and the other for opening the circuit it controls, and their action is to rock a pivoted block carrying a second mercury-tube switch.

Changing the Figures

With the energising of the " make " solenoid the switch moves over and closes the circuit through the two brake magnets of the minute-band gear unit, thus setting the band in motion and causing the next figure to appear in the frame. As the band comes to its correct position an arm mounted on the spindle of its driving sprocket engages with and operates a switch closing for a few seconds a further 6-V circuit through the " break " solenoid of the relay. As a result the brake-magnet surface is immediately opened, the springs attached to the brake-shoes come into action, and the band stops until the process is repeated at the next minute. The other relay switches, dealing with the ten-minute and hour-band changes, are identical in construction with that of the minute band, but in the case of these the circuits through the " make " solenoids have an additional break in each. These breaks take the form of pairs of contact points, that of the " tens " solenoid circuit being closed at each tenth and that of the " hour " solenoid at each sixtieth minute.

The count wheel is provided with sixty teeth and is stepped round one tooth at each minute. When its pins close the contacts and enable the 6-V circuit completed by the worm-wheel to energise further " make " solenoids in addition to that of the minute band, the effect is to close the circuits through the other brake magnets and the appropriate belts will thereupon move onward.

The action of the whole chronoscope is remarkably even and quick, and, although the bands weigh together about three-quarters of a ton, the actual change is achieved in eight seconds.

In its position in the station the numeral frame is surrounded by a neon-tube advertisement, but, despite the brilliance of this, the floodlit figures show up distinctly. The timepiece has been installed by Messrs. William Whiteley, Ltd., the contract for it was placed with Smith's English Clocks, Ltd., and the actual design and manufacture were carried out by Messrs. Gillett & Johnston, Ltd., who have supplied the illustrations to this article.

Transformer Efficiency. By E. V. Clark, B.Sc., M.Inst.C.E., A.M.I.E.E.

The most suitable relationship between iron and copper losses

THE transformer lends itself admirably to what may be called academic design—that is to say, design aimed to achieve particular results in detail. With no revolving parts, and therefore no frictional losses, obeying uncertain laws, its dimensions and proportions may be modified on paper as many times as desired, and the consequent alteration of losses computed with considerable accuracy, until the most satisfactory paper design is attained. The transformer, when built, will be found to agree within a very small margin with the calculations. Further, after its main dimensions have been fixed, the mere variation of the number of turns to be put in its windings, by altering the flux density and current density, will markedly change both magnitude and ratio of iron and copper losses.

In the early days of single-phase distribution, it was realised that as iron losses are continuous, whereas copper losses are insignificant unless the load is considerable, the energy wasted in the transformer would be a minimum if the iron losses were kept very small. But soon came recognition of the fact that it is minimum cost of wasted energy rather than minimum amount that should be aimed at; and that iron losses, with their load factor of almost 100 per cent., are worth per kWh appreciably less than copper losses which not only have a very poor load factor but also have a peak which synchronises with that of the load which the transformer carries.

For any particular copper-loss load factor, it is a simple matter to compute that ratio of copper to iron loss at maximum load which will result in minimum amount of energy loss. But the design for minimum value of losses is a very different matter, particularly because with an undertaking which generates its own power it is exceedingly difficult to make even an approximate estimate of the actual extra cost entailed by loss of energy in transformer copper. With the advent of the grid and the shutting down of numerous generating stations, many undertakings are now, or shortly will be, buying the whole of their electricity, and energy wasted in their transformers must be paid for at the same rate as energy sold. The problem of the most efficient design of transformer assumes, therefore, a new aspect.

With a flat rate per kWh, the transformer should be designed for minimum losses under its expected load cycle. With a two-part tariff based on kW of peak plus kWh, the problem also allows of a simple mathematical solution, subject to a knowledge of the load cycle, and to a few legitimate though minor assumptions.

But with a two-part tariff based on kVA of peak plus kWh, the solution is not so definite, since the peak-load power factor of the system fed by the transformer and the power factor of the transformer's magnetising current both enter into consideration.

Flux and Current Densities

Consider a transformer (on paper) of approved dimensions and general design, to be operated upon a system of constant frequency and voltage at such flux density in the iron and current density in the copper that at full load these losses are equal to one another and of magnitude a kW each. In accordance with an elementary law of design, this transformer will attain its maximum efficiency at full load.

If B is the flux density, and D the current density, the input of the transformer is proportional to BD; and if the number of turns in the primary and secondary windings, but not their ratio, be altered in any manner, and the rating of the transformer be unchanged, then the flux density will be altered in inverse ratio to the change in the number of turns; and on the assumption of constant space factor in the windings, the current density will be altered directly as the number of turns, the weight of copper being unaltered. Thus to vary the relative magnitude of current and iron losses, all that is necessary is to alter the number of turns; and if current density is increased from D to nD, the flux density will be reduced to B/n.

Copper losses, weight being unchanged, vary as current density squared. Of the iron loss, the part due to eddy currents varies as flux density squared; although that due to hysteresis does not rigidly obey any mathematically expressed law, still with modern transformer irons and densities ordinarily used, the assumption that hysteresis loss varies as flux density squared also is reasonable. Thus if alteration in the number of turns is such that flux density is changed from B to B/n, then iron losses are changed from a to a/n^2, and total transformer losses at full load are $a(n^2+1/n^2)$ kW. Clearly, the value $n=1$ makes full load losses a minimum, or in other words a transformer has maximum capacity for continuous loads without exceeding the specified temperature limit, if its ful-load copper and iron losses are equal.

Abundant light is needed in cinema work. At the Gainsborough Studios, Islington, this is provided by a large battery of projectors (about 650 kW), the result being seen in the right-hand picture, which shows a "set" from the musical comedy "Aunt Sally"

Calculating the Cost

Let the tariff under which electricity is bought be the two part one of p pence per annum per kW of peak load, plus q pence per kWh. Then as iron losses have magnitude a/n^2 and, if fluctuations in pressure be ignored, a load factor of 100 per cent., their annual cost will be $(p+8760q)\ a/n^2$ pence. Copper losses will have a peak load of an^2, assuming that the rating of the transformer is the same as the maximum load that it has to carry long enough to register on the metering equipment; if they have a load factor of f, their cost per annum will be $(p+8760fq)\ an^2$. The total cost of iron and copper losses per annum is therefore $(p+8760q)\ a/n^2 + (p+8760fq)\ an^2$.

For minimum annual cost, differentiate with respect to n and equate to zero. This gives $n^4=(p/q+8760)/(p/q+8760f)$ and from this n is at once determinable for any particular tariff and copper-loss load factor.

With a tariff based on kVA the computation of the standing part of the cost of the iron and copper losses is based on the fact that if a small current I at phase angle ϕ be added to a large current I_0 at phase angle θ, the result is very nearly $I_0+I\cos(\phi-\theta)$ at phase angle θ; and therefore that if a small load L at phase angle ϕ be added to a large load L_0 at phase angle θ, the increase in kVA is approximately $L\sec\phi\cos(\phi-\theta)$. Thus, if the peak load on the system supplied by the transformer has phase angle θ, and copper losses have peak value an^2 at unity power factor, then the increase they cause upon the reading of the kVA meter is $an^2\cos\theta$; and if the magnetising current of the transformer has phase angle ϕ, the

kVA added by the transformer iron losses will be a/n^2 .sec ϕ cos $(\phi-\theta)$.

Hence, if the two-part tariff is r pence per annum per kVA of peak load, + q pence per kWh, the annual cost of copper losses is $(r \cos \theta+8760qf)\ an^2$; and that of the iron losses is $(r \sec \phi \cos (\phi-\theta)+8760q)\ a/n^2$; so that the total cost per annum of the transformer losses is the sum of these, or $C=(r \cos \theta+ 8760qf)\ an^2+(r \sec \phi \cos (\phi-\theta)+8760q)\ a/n^2$.

Differentiating as before, and equating to zero, we find that the annual cost is a minimum if $n^4=(r/q.\ \sec \phi \cos (\phi-\theta)+8760)/(r/q.\ \cos \theta+8760f)$. This differentiation, it should be noted, is not strictly legitimate, since the phase angle of the magnetising current is not independent of n. However, the error introduced must be quite small.

Evaluation of Equations

A tariff based on kW that seems appropriate to modern bulk supplies is £3 10s. per kW per annum plus 0.25d. kWh. Here p is 840, and q is 0.25, and the ratio $p/q=3360$. A reasonable range of values for p/q is perhaps from 2400 to 4800. The load factor of the copper losses is sure to be low, since it is based on the average value of the current squared. Table I below suggests in rough outline a typical average daily current load curve for a smallish undertaking without much industrial load; and the copper-loss load factor works out as 11.6.

TABLE I.

% Full Load Current.	Hours.	% Full Load Losses.	Weighted Losses.
75	1	0.56	0.56
70	1	0.49	0.49
60	1	0.36	0.36
50	2	0.25	0.50
25	13	0.062	0.81
10	6	0.01	0.06
	24		2.78

load factor of copper losses, 2.78/24 = 11.6 per cent., and
load factor of current, 6.90/24 = 28.7 per cent.

This average-day load allows of a peak three-quarters of the maximum sustained load of the year. The annual load factor of the system will be somewhat under the figure of 28.7 shown in the table, both because this is based on current, not power, and ignores phase angle, and also because the load considered is that of the average day based on copper losses, and not on actual loading. The figures are therefore not unreasonable for the circumstances cited; in other conditions, the copper loss load factor, 11.6 here, might be expected to range from, say, 5 to 15 per cent., according to how much load other than lighting had been secured.

As an indication of the probable range of the value of n in areas where the standing charge is based on kW, this will be calculated for four cases, using for one variable the reasonable value suggested above, and for the other the extreme values that have been named. The results we obtain are as follows :—

When p/q = 3,360 and f = .05, n = 1.33
When p/q = 3,360 and f = .15, n = 1.26
When p/q = 2,400 and f = .116, n = 1.35
When p/q = 4,800 and f = .116, n = 1.23

If the two-part tariff is based on kVA, there are further assumptions to be made, concerning phase angle of peak load, θ, and of transformer magnetising current ϕ. The latter may, perhaps, be taken as 75 degrees, making the iron-loss power factor about 0.25; whilst an undertaking such as is under contemplation, with peak load chiefly due to lighting, may be expected to have a peak-load power factor of about 0.87, making θ=30 degrees. Thus cos θ=0.87, and sec ϕ cos $(\phi-\theta)$ becomes 2.8. An appropriate tariff based on kVA may be £2 10s., plus 0.25d., making the ratio r/q=600/0.25=2,400, when r/q cos θ becomes 2,080, and r/q sec ϕ cos $(\phi-\theta)$=6,700. If, further, the copper-loss load factor f=11.6 per cent., as before, then n=1.49.

With so many variables, it hardly seems worth while endeavouring in this case to estimate the probable range of n. It is quite evident that the peak-load power factor of the load carried by the transformer must have marked influence; and the poorer this power factor the smaller should be the transformer iron losses, if cost of energy lost is to be a minimum.

Ratio of Losses and Regulation

If the tariff is based on kW, then n should lie between, say, 1.20 and 1.35, n being, as before, the ratio of current density to that which makes iron and copper losses equal at full load. Thus copper loss at full load, an^2, will lie between 1.44a and 1.83a; and iron losses, a/n^2, between 0.7a and 0.55a; and the load to give maximum efficiency,—*i.e.*, to make iron and copper losses equal—must consequently lie between 70 per cent. and 55 per cent. of full load. Further, full load losses will lie between 2.14a and 2.38a, as against 2a if maximum efficiency occurs at full load.

With a transformer designed to have minimum cost of losses under the kVA type of tariff, conditions are exaggerated. With n=1.49, the full-load copper loss will be 2.23a and the iron loss 0.45a. Thus total losses at full load will be 2.68a, or 34 per cent. more than necessary; and maximum efficiency will be reached at 45 per cent. of full load.

Economy is not the only valuable feature of a transformer. Good regulation is also important, the degree of importance depending on a variety of circumstances. Now, under conditions of good power factor, good regulation chiefly depends on low transformer resistance, and under conditions of lagging power factor, on low ratio of leakage flux to core flux. Thus low flux density and high current density are conducive to poor regulation. A transformer designed for maximum overall economy of losses will therefore be appreciably worse in its regulation than it need be, both with high power factor and with low.

If conditions of line drop, &c., are such that some automatic regulation of pressure, by on-load tap changing or by induction regulator, is essential in any case, then a slightly poorer inherent regulation of the transformer will be of little moment; but where, as in most cases, the transformer is not provided with voltage control, it will usually be wise not to push the copper losses as high as minimum cost of lost energy might suggest.

The Question of Cost

Any reduction of iron losses at the expense of copper losses must increase the total losses at full load for the same weight of active material, and therefore must reduce the British Standard rating of the transformer, since this is defined as the kVA load that can be carried continuously without heating beyond the allowable temperature rise. The reduction of rating may be very considerable if n is raised unduly. For example, if n=1.35, or maximum efficiency occurs at 55 per cent. of full load, the full load losses are 19 per cent. higher than they need be; and the British Standard rating must therefore be reduced by about 10 per cent.

However, this is more a matter of nominal rating than anything else, and does not mean that a more costly transformer must necessarily be purchased, if designed for minimum losses, as long as the design is not pushed too far. On the contrary, designing for low iron losses makes the transformer run cooler under normal load, the total energy loss converted into heat per diem on the schedule shown in Table I being reduced by 30 per cent. if the transformer is designed for n=1.35 instead of n=1; it is only when the load is maintained at over 75 per cent. full load for some hours that the more economical transformer will exceed the temperature of the other. That is to say, it is only in the depth of winter that a distribution transformer designed expressly to minimise cost of energy losses is likely to become hotter than need be; and this is just the time when temperature rise is least serious.

The calculations have been based on the assumption that the rating of the transformer is the peak load carried long enough to be recorded on the maximum demand element of the metering arrangements. This assumption is certainly open to question, since on any undertaking which was not growing, one could well allow the sustained peak load to be some 20 per cent. or more above the transformer rating, with complete equanimity. But in any normal undertaking showing steady growth, transformers must be put in a good deal larger than is immediately necessary, to avoid frequent replacements; to assume that the sustained load reaches the transformer rating in about the mid-year of its use in a particular location seems fairly rational.

Standards for Distribution Transformers

In one respect, mathematical calculations made for maxima and minima, whatever they may concern, are apt to be misleading. We find conclusively that under set conditions n should be 1.25, let us say; and this suggests that to make n=1.35 will depart seriously from optimum design. But fortunately, by the very nature of curves, whenever a maximum or minimum is set, one may expect to find that the curve is very flat for a considerable range on either side, and therefore that one may depart very appreciably from the ideal point without making conditions more than a shade less satisfactory than they might be. This is so in the present instance, as it will be found that a variation in n of 10 per cent. from its optimum value on either side affects the total cost of transformer losses by only about 2 per cent.

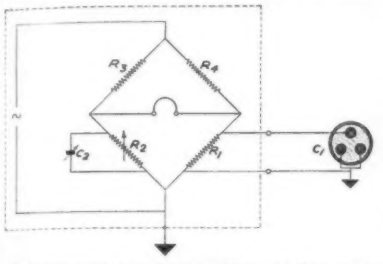
As seen above, considerations of regulation suggest that the copper loss should not be pushed quite as high as economy would urge, and temperature rise on the test bed at full load trial run the same. Hence with transformers to be used on a system which purchases electricity upon a two-part tariff based on kW, maximum efficiency at about 70 per cent. full load (n=1.2) is a reasonable thing to specify. But where the standing part of the tariff is based on kVA, and peak-load power factor is good, then maximum efficiency at about 60 per cent. full load (n=1.3) is wiser for transformers not equipped with automatic voltage control; while where they are so equipped, or where peak-load power factor is low, then maximum efficiency at half load or even less (n=1.4 or more) may well be called for in many cases.

Cable Fault Localisation.

By W. L. Beck and G. F. Shotter

A new self-contained a.c. capacity bridge

ONE result of the larger amount of power behind a modern distribution network is an increase in the number of open-circuit faults which result from a burn-out on one or more cores. This type of fault can seldom be localised by a ballistic capacity measuring set on account of the leakage which takes place through the mass of charred insulating material surrounding the break in the cores of the cable. The use of an a.c. capacity bridge for this purpose has been suggested, but such bridges, mainly developed for use in the laboratory, often consist of components connected up to suit some special test, and are therefore not easily employed for fault localising where speed is of great importance.



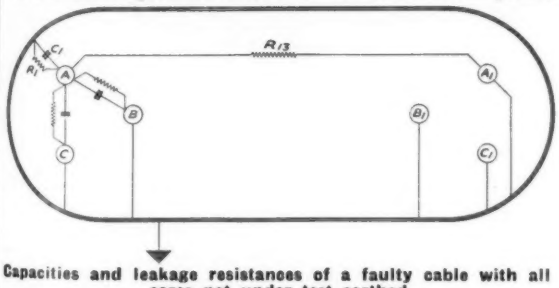
Diagrammatic representation of the capacity fault localising bridge

To overcome these difficulties, a special self-contained bridge has been developed by the Cambridge Instrument Co., Ltd., in conjunction with the North Metropolitan Electric Power Supply Co., which has operated satisfactorily during the past twelve months. Two special features governing the design of the bridge are that the "insulation" or leakage across a fault may be low and varying, and the earth point of the bridge and the shielding of the components must be such that the readings are independent of the situation and external influences. The range of capacities which have to be measured usually lies between 0.01 and 1.0 mF., but for long cables the capacity may have to be extended to 5 mF. or more.

The accuracy should be such that a fault can be localised to within a few feet, but the actual accuracy that can be obtained is also dependent on the accuracy by which the cable length is known, and the accuracy with which the calculated length to the fault can be measured. For instrument errors to be neglected they should not exceed ±0.2 per cent., and the supply to the bridge must be at a convenient audio-frequency if advantage is to be taken of a telephone, in a robust and portable instrument, to indicate balance.

Arrangement of Circuits

Referring to the schematic circuit diagram above the capacity c_1 of the cable to be measured is balanced on an equal ratio bridge against a calibrated standard condenser c_2 formed by a 1.11-mF. precision three-dial mica condenser in parallel



Capacities and leakage resistances of a faulty cable with all cores not under test earthed

with a calibrated variable air condenser. Additional condensers may be connected to extend the range. To minimise the effect of variation in the fault leakage resistance and to simplify the resistance balance c_1 is shunted by a non-inductive resistance R_1, and the combination is balanced by a three-dial resistance R^2. The oscillator which supplies the 800-cycle input is self-contained in the localiser and is energised from the low-pressure a.c. mains. Provision can be made for alternative battery operation in special cases.

The instrument measures 19 in. × 17 in. × 8½ in. over the case, has a detachable lid and carrying handle, and is sufficiently robust for the localiser to form part of the normal equipment of a mains department breakdown van. The bridge is balanced by adjustment of the condenser and resistance dials until silence is obtained in the telephone, and the sensitivity is sufficient to give an accurate measure of capacity outdoors when the insulation of the cable is as low as 50 ohms. The capacity of the cable is read directly on the four calibrated dials, and the resistance balance is made on the three resistance dials at the front of the panel.

Although the method of applying the capacity bridge must depend, to some extent, on the condition of the conductors, some general procedure can be laid down. Taking a three-core cable on which each core is severed at the fault, the capacities and leakage resistances at each end of the cable can be represented by the diagram below. The capacities between the cores and the sheath, and between the cores, are for the most part distributed evenly along the conductors, while the leakage resistances are mainly concentrated at the fault. In practice, however, only one or two of the cores may be severed, or a core may be directly short-circuited to the sheath or to another core, and this will have the effect of eliminating some of the qualities or connecting others in parallel. In an earthed screened type of cable the capacities between the cores will be eliminated by the intersheath.

Before localising by the capacity bridge, it is necessary to determine the condition of the conductors at the fault. A "Megger" test between cores and between cores and earth will give the necessary information regarding the insulation and for the continuity test a low resistance "Megger" can be used, "shorting" each pair in turn at the extreme end.

An Actual Example

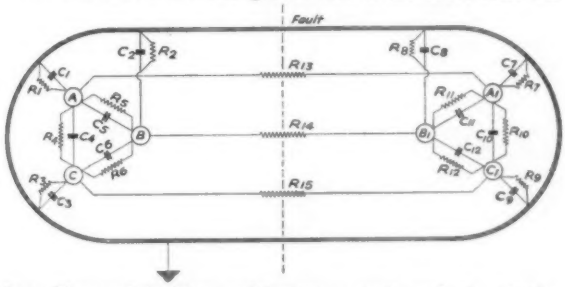
If any attempt is made to measure the capacity of a conductor to the sheath of a three-core cable with the other cores at both ends left floating, the capacity which is measured will be the sum of its capacity to the sheath plus the partial capacities and resistances in series through the network. The only way of eliminating the uncertainty of measurement from this cause is to bond each conductor to earth at both ends of the fault, except the one on which a measurement is being taken. The necessity for this step is well illustrated by a test which was taken on an actual fault on a 3,900-ft. length of 0.05 sq. in., 3,000-V, three-core cable.

A view of the bridge

The following conditions existed as to leakage: from "A" end, red phase 10,000 ohms, white phase 15,000 ohms, blue phase zero. From "B" end, red phase 10,000 ohms, white phase 5,000 ohms, blue phase 10,000 ohms. With all cores floating the calculated length to the fault from "B" end was 830 ft. With the cores at the test end floating and at the opposite ends earthed the calculated length to the fault from "B" end was 834 ft. With all the cores except the test core earthed, the calculated length to the fault from "B" end was 915 ft. The actual distance was 910 ft.

The calculation of the length on each of the above tests was based on the sum of the mean value of the capacity of each section. The capacity of individual cores may vary over a given length of cable by as much as 0.5 per cent., and a larger variation may be expected between different lengths of the same cable. To minimise the errors from this cause, it is an advantage to take the mean of all the available readings as a basis for the localisation. If a choice has to be made between two cores for a single reading, the one with the higher insulation generally gives the best value.

The actual distance to the fault from one end of the section is obtained from the ratio of the capacity from that end to



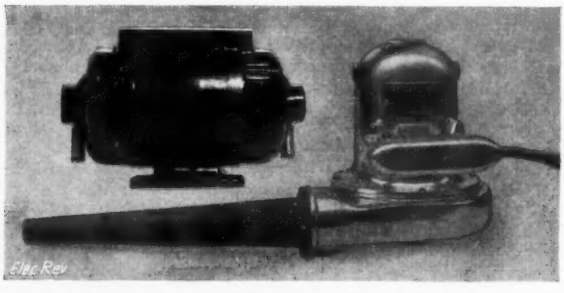
Capacities and leakage resistances at each end of a faulty cable with the ends floating

the total capacity multiplied by the total length of the section. This method, of course, involves taking readings from both ends of the cable. If the average capacity of the cable per unit length is known, the distance can be readily determined by a measurement from one end. Different lengths of cable, even of the same manufacture, however, may differ by 1 per cent. or more in this respect. Perhaps the most satisfactory method of localising from one end is to measure the capacity of each new section of cable as it is laid, and to record this value on the cable chart. This would enable a rapid localisation to be made from one end, although, where possible, tests from both ends are more satisfactory.

Special Fractional H.P. Motors

The trend towards unusual and stringent specifications

WHAT interested us most during a recent visit to the works of the Croydon Engineering Co. was the production of fractional h.p. motors to what, until fairly recently, would have been considered unusual and stringent demands. The following notes concerning some of the com-

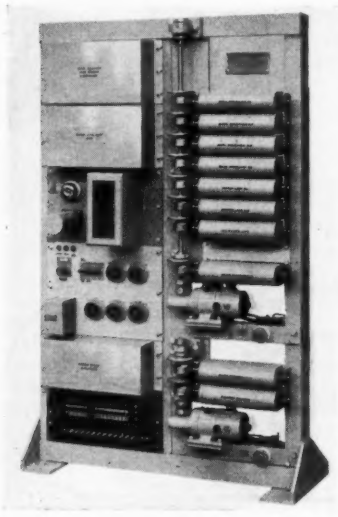


Left: A 500-W rotary-converter as used for Western Electric "talkie" apparatus. Right: Sturtevant blower incorporating a fractional h.p. motor

pany's products show that the present-day purchaser certainly does not regard the very small motor merely as a piece of rotating mechanism.

Motors employed for Creed teleprinters are now definitely specified for by the Post Office. The machine is rated at 30 W, 3,000 r.p.m., and has a special frame, without feet, held to the teleprinter by machined bosses on each end cover, which, to ensure complete interchangeability, have tolerances of 0.001 on the diameter and 0.003 on the overall length. A plug-type terminal block fixed to the barrel of the body is also machined, so that the motor is practically machined all over.

Great precaution is taken to guard against failures; for instance, the machine is fitted with two independent brushes per spindle to prevent jammed brushes and to reduce the current density per brush, the specification incidentally calling for 1,000 hours' brush life on a.c. and 2,000 hours on d.c. The commutator and brush rocker gear are shrouded by a bakelite cover which, when removed, provides the service engineer with easy access to the vital parts of the machine.



Geared and governed motors fitted to Standard Telephones power station grid supervisory panel

The specification of this machine is one of the most stringent ever encountered by the company. The d.c. shunt specification, for instance, has two clauses, which read: "Speed of the motor must not exceed the rated speed at plus 10 per cent. of the voltage at half load when at a temperature of 15 deg. C.," and "must run at not less than its rated speed at a maximum of 10 per cent. at three-quarter load with a governing resistance in the field, at a temperature of 15 deg. C." Coupled with these requirements is a requirement that the machine must have a starting torque of twice full load when on two-fifths of the normal voltage.

A new universal machine has been designed to simplify stocking and portability of the teleprinter. It has voltage ranges of 100/110 V a.c., 100/110 V d.c., 200/230 V a.c., and 200/230 V d.c. Change over from one supply to another is accomplished by moving a small wander plug. This motor, used together with a Creed governor, is proving very successful.

Another unusual type of motor, designed and developed for Standard Telephones & Cables, Ltd., is a geared and governed machine for driving the switchgear mechanism on power station supervising control panels for the grid system. It is a low-voltage d.c. shunt-wound ball-bearing machine fitted with a totally enclosed reduction gear and controlling governor. This specification is also very unusual, quite apart from the special mechanical details of the frame. It calls for two machines having outputs of 1/50th h.p. at 2,300 r.p.m., 50 V normal supply, with 100-1 reduction gear, and 1/110 h.p. at 1,100 r.p.m., 50 V normal supply, and 100-1 reduction gear.

This machine was required to obtain full speed in one-fifth second and, which was even more difficult, to have a speed variation from no-load to full-load of not more than 2 per cent. over a voltage range of 45-56 V d.c., this being the maximum tolerance anticipated from the battery supply. This was very satisfactorily accomplished by employing totally enclosed governor gear as an external resistance inserted in the shunt circuit.

Another recent development of note is a motor produced for the concern's associated company, the Sturtevant Engineering Co., Ltd., for use with a high-powered portable blower. It has an output of ¼ h.p. at 12,500 r.p.m., giving a blower output of

Application of 30-W motor to a Creed 7A teleprinter

32 in. water gauge. The windings naturally have to be very carefully protected against the resultant centrifugal forces set up by the high armature speed, and a special system of binding the end coils was evolved, together with a special impregnating process. These refinements have proved to be very successful, the machine being practically vibrationless. As this machine is of the portable hand type, close attention had to be paid to lightness, coupled with strength, and the motor itself weighs only 8¼ lb.—a very low figure considering the large output.

Some equally exacting specifications have been met with in connection with the company's developments in rotary converters for neon-lighting and "talkie" apparatus, and a very good example as to what fine limits can be worked to in these small machines is illustrated in a specification recently met for the Western Electric Co. The converter used for converting d.c. to a.c. for portable talkie apparatus has an output of 400 W. It is of the semi-enclosed ventilated sleeve-bearing type, does not exceed 50 lb. in total weight, and is silent.

The most difficult clauses met with in the specification were the small tolerances allowed in the frequency and output over a voltage input range of 200/250 V. At full load at 0.8 power factor, with an input of 230 V d.c., the a.c. output voltage had to be 220 V ± 2 per cent., and the conversion ratio of 0.96, *i.e.*, 230 V to 220 V, had not to vary by more than ± 2 per cent. over the voltage range of 200/250 V d.c. When operating on any voltage between 200/250 V, the regulation from no load to full load at 0.8 power factor was not to exceed 15 per cent., and the frequency regulation over the same conditions was not to exceed 5 per cent.

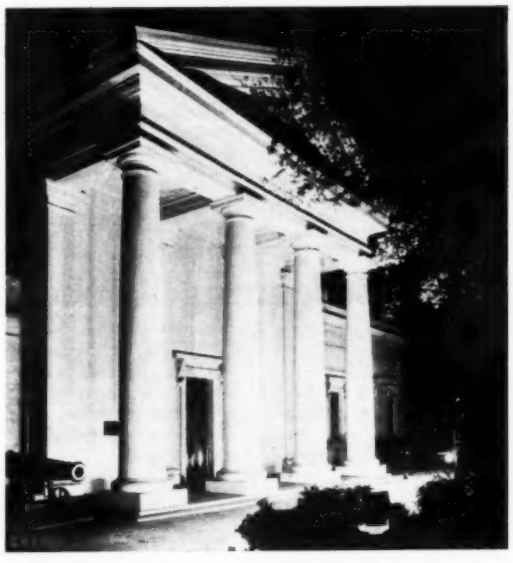
The "Escura" Discharge Lamp

A NEW gaseous discharge lamp has been developed by the Edison Swan Electric Co., Ltd., at its Ponders End lamp works. This comprises a special hard-glass inner bulb permitting a high mercury-vapour pressure to be obtained and giving a light approaching white in colour. The inner bulb is enclosed in a glass jacket, the space between the two bulbs being evacuated so as to retain the heat in the inner bulb. The overall dimensions, with standard G.E.S. cap, are about 12 in. long by 2½ in. in diameter.

At present the "Escura" (gaseous discharge) lamp is made only for 400 W, and is for use on 200 to 250-V a.c. circuits. It is necessary to use a choke in series with the lamp and desirable to employ a condenser across the leads to the choke and lamp to correct the power factor.

The lamp efficiency is approximately 40 lumens per watt, *i.e.*, the light output is nearly equal to that of a 1,000-W gasfilled lamp on similar voltage. The life is said to be at least 1,000 hours. The light is low in red, causing accentuation of blue and green colours, although red does not disappear when illuminated.

The lamp lights immediately it is switched on, a 6-A arc striking between the electrodes, and no auxiliary heating is required. After about three minutes the arc narrows down to a cord of light about 6 in. long and ¼ in. (approx.) in diameter. The overall efficiency builds up to the maximum after a further ten minutes, when the lamp attains the normal running voltage drop of 180 at 2.5 A. The lamp is made to operate in the vertical position, either "cap up" or "cap down," only.



A floodlighting installation employing seven "Escura" lamps (3 kW). About 7 kW of gasfilled lamps would be needed to produce the same results

The new lamp is particularly suitable for lighting large areas, but, owing to the difference in the natural light distribution from that of an ordinary gasfilled lamp, special equipment is, in many cases, necessary to ensure satisfactory results. Where no special control of the light flux is necessary other than general diffusion the lamp can be satisfactorily employed in existing diffusing lanterns. The Edison Swan Electric Co. has designed special units for the definite light control demanded in street lighting.

Characteristic of the new lamp are the remarkable colour effects produced. In floodlighting, accentuation of the various shades of green in plants, trees, and shrubs is accomplished to a degree which is unattainable with ordinary electric lamps. We illustrate a striking example of floodlights carried out with "Escura" lamps.

Overhead-line Distribution Abroad

The first meeting of the session of the O.L.A.

OVERHEAD-LINE distribution practice in North America and Scandinavia was discussed at the first monthly meeting in London on September 20th of the 1933-34 session of the Overhead Lines Association.

Mr. A. L. Stanton, president, said that while the paper by Mr. R. E. Jones, of the Hydro-Electric Power Corporation of Canada, which was published in the O.L.A. *Proceedings* of May last was an excellent digest of current practice in North America comparisons were very difficult to make by reason of the difference in conditions.

In the United States not more than 5 per cent. of the street lighting was done by gas and not more than 25 per cent. of the factory supplies were from independent plants. Moreover, in North America utilitarian objectives were paramount and therefore the early development of many American supply systems using overhead lines provided little evidence of the attention to reliability of service, voltage regulation, and freedom from common elements of danger to life that was recognised to-day.

Mr. Theodore Stevens showed a number of lantern slides demonstrating the conditions of supply in North America and Canada. Mr. R. F. Markham commented on the large number of conductors for different services that were run on the poles carrying low-voltage lines in Canada, and also the large section of some of the cables. He asked if that was due to the lower voltage used for distribution as compared with this country.

Mr. W. Fennell referred to the adoption of multiple earthing in North America, which, he said, gave the opportunity for fairly considerable savings in transformers as well as in the line. In the Mid-Cheshire area they obtained the equivalent by using the earth wire as the low-pressure return. The use of multiple earthing in this country, however, was objected to by the Post Office; the Association should endeavour to obtain information on this point and place it before the Electricity Commissioners and the Post Office. He had used an American fuse known as the "Matthew" type in Mid-Cheshire for seven or eight years with exceedingly satisfactory results for single-phase work for connecting transformers of certain capacities. He had tried, without success, to persuade British firms to make a similar fuse.

Mr. H. Wilson remarked that the supply authorities in North America and Canada appeared to be free from the vexatious regulations which gave so much trouble in this country. For instance, some of the illustrations showed a high-pressure line along one side of the road and a telegraph line along the other, but the British Post Office regulation of a distance of one and a half times the height of the pole between such lines meant that in this country the h.p. line was pushed off the road, so that the supply authorities were faced with wayleave problems. If the use of a large number of wires for different purposes on the same pole increased the height of the pole then the saving might be more apparent than real.

The president said it was quite common across the Atlantic in connection with a.c. networks to find poles with high-voltage lines at the top, followed by street lighting wires and then the ordinary residential distribution. There were also joint poles carrying wires belonging to the Bell Telephone Co. in addition to high-voltage lines, street lighting lines, and trolley wire. The size of the distribution wires was due to the fact that the electric cooking load often represented a very large proportion of the total. A loading of from 50 to 100 kW per thousand feet of main was quite common. As a result, in many parts the problem of the expense to be incurred in putting down proper networks with suitable protective conditions had now to be faced. Multiple earthing was adopted because transformers were used for every conceivable purpose, and all kinds of tappings were made which would be looked upon as outrageous in this country. Lightning arrestors were also used much more extensively than here, and had been found an effective safeguard.

Conditions in Scandinavia

Mr. T. Stevens then showed a number of lantern slides and gave a good deal of statistical information with regard to the development of electricity supply, especially in the rural areas, in Sweden, Denmark, and Norway. Sweden is divided into fifteen areas for supply purposes, in many of which the State gives the supply, the remainder being municipally or privately owned supplies. In the No. 4 area, between Gothenburg and Stockholm, in 1932 the consumption was 1,288 million kWh. This area comprised twelve million acres and contained 550 authorities distributing energy supplied by generating stations owned by the Government. There were 1,700 water-power stations in Sweden supplying exclusively rural areas, in addition to 700 other plants, and in all there was a total of two million h.p. of plant installed. The output for the whole of Sweden in 1931 was 5,100 million kWh, of which 50 per cent.

was consumed by large industries, 15 per cent. by electro-chemical works, and 12 per cent. for domestic supply and small industries, the remainder being used for various other purposes. At the present time a number of lines designed for 220,000 V were operating at 132,000 V. For the most part copper, with a steel neutral wire, was used for the conductors, but some aluminium was also used.

In the No. 4 area there were five water power plants having a total capacity of 262,000 kVA and one steam plant with a capacity of 122,000 kVA, in which was a particularly interesting oil-fired steam boiler capable of producing 350,000 lb. of steam per hour. It could be started up from cold in twenty minutes, and was 50 ft. square and 118 ft. high, the tubes being hung from the water drums, which were about half-way up the structure. In the co-operative distribution associations in Sweden consumers were compelled to hold shares in proportion to the acreage of their farms, or number of rooms in their dwelling houses. A certain length of cable was laid free of charge, and supply was given on the basis of a three-part tariff which, however, was varied in an upward direction where only small supplies were required, the average total cost to the consumer in 1932 being 0.838d. and 0.965d. per kWh respectively.

Denmark exported to Southern Sweden steam-electric power at times when water was insufficient in Southern Sweden. Sweden reciprocated when necessary and its exports had grown in recent years from 20 to 90 million kWh, the amount in the other direction being much smaller. There were three submarine cables connecting the two countries. Sweden had 2,387 hydro-electric plants, of which 116 had a total capacity of one million kW. Although there was an interconnected grid in western Norway, it had been found that a better solution for the smaller area was to have an individual plant in each case.

An Oil-cleaning Process

THE Stone-Empson process of purifying liquids has been developed particularly for removing solids which are in such a finely divided state that they are colloidal in dimensions and do not therefore respond to ordinary forms of separation such as gravity settlement or normal centrifuging. The method depends upon a phenomenon and has not hitherto been utilised in this connection, and the process itself, in addition to the special plant developed for the purpose, has been patented by the designers in the leading countries of the world.

The Stone-Empson oil-purification plant

It is based upon the discovery that ordinary water properly atomised in an old-containing colloidal carbon acts as a perfect coagulant, its action being to neutralise the electric charge carried by the carbon particles and thus stop the " Brownian movement " to which they are subject and which interferes with precipitation. This process is carried out in a " colloid coagulator," the function of which is to atomise the added water in the oil, after which the neutralised carbon particles rapidly coagulate into comparatively large clots which can then be separated by gravity settlement or, better still, by centrifugal means.

The coagulator consists of a small disc-like rotor revolving at 10,000 r.p.m., provided with a number of vortex passages which create enormous turbulence between the liquids and ensure the desired degree of atomisation. The rotor is surrounded by a detachable casing in which the liquid is collected and discharged into a time-lag tank. The rotor is driven by means of a single train of worm gearing driven by a 1-h.p. flange-mounted electric motor running at 2,800 r.p.m. for dealing with about 100 gallons of dirty oil per hour. This machine is mounted on a steel frame containing a time-lag tank as well as an aluminium panel on which are mounted all the necessary instruments, control valves, &c., the whole being encased in blue planished lagging steel secured by polished aluminium angles.

The time-lag tank is fitted with several baffles to retard direct passage of any part of the oil from the inlet to the outlet, and thus secure a few minutes' delay for the agglomeration of the neutralised carbon particles. The oil then passes into an ultra-centrifuge, which has been specially designed to deal with oil in this connection and incorporates a number of novel devices. Special features include a preliminary separating space inside the revolving drum which enables the more readily separable particles of water and clots of carbon to be discharged direct to the walls of the drum without being remixed with the oil.

The design prevents the passage of a large proportion of the oil which passes through the cones nearest to the inlet, and ensures absolutely even distribution between the whole of the cones, which are, furthermore, not perforated as usual. The oil enters from the outer edges; the whole area of the cones is used for separation, which is therefore effected principally in the zone of the highest centrifugal force. Though the drum speed is 7,000 r.p.m., the centrifugal force and mechanical stresses are not above normal.

The construction of the drum enables it to discharge the separated carbon continuously with the assistance of a very small amount of hot water admitted with the incoming dirty oil, and the machine can therefore be run for very long periods without stops for cleaning. A special spanner secures dismantling in one action and allows the working parts to be handled on the bench direct, without waiting for them to cool off.

An Unusual Driving System

The driving mechanism is novel in that the motor is made an integral part of the frame. The motor shaft is hollow and the high-speed drum spindle passes through it and is driven by a special train of gearing provided with an automatic clutch which relieves the load on the motor at starting. This train of gearing is also arranged to drive one or two oil pumps, as may be required, which are compactly fitted on the gear box and easily detachable for inspection. Automatic forced lubrication is employed throughout.

The oil is heated by steam, to avoid overheating. If desired the steam can be produced electrically with automatic temperature control. This auxiliary unit does not increase the overall dimensions of the set. The outfit is entirely self-contained and can be made transportable on wheels. It is manufactured by Messrs. J. Stone & Co., Ltd., Deptford, and its use permits the reconditioning of oils so dirty as to be regarded as unfit for further use. The process is equally suitable for treating electrical insulating oils and lubricants.

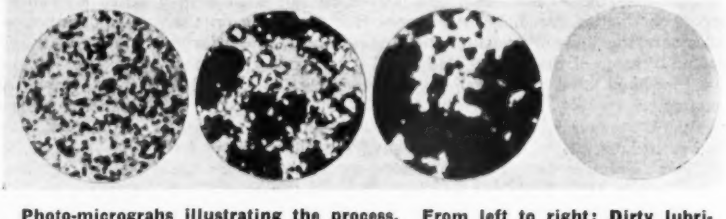


Photo-micrographs illustrating the process. From left to right: Dirty lubricating oil from Diesel engines; the same oil after coagulation; carbon, &c., discharged from the water spout of the separator; and purified oil

The water added in the process of coagulation ensures the thorough saturation of all microscopic fibres and their final removal in the ultra-centrifuge, thus rendering the oil much less susceptible to the effects of any moisture which may gain access to it under service conditions. In the case of switch oil containing colloidal carbon the removal of this impurity is claimed to be so complete that an 18-in. column of oil viewed by transmitted light shows not the slightest trace of greyness. All water-soluble acids are removed and the dielectric strength is easily brought up to over 50 kV.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

A Red-tape Worm

I should like to inquire if you, or any of your readers, could tell me if statistics or records are available of failures (if any) of overhead line road crossings, which have been carried out in accordance with the regulations applying in such cases.

I have been out of the country for some years, and it is a shock to see all over the place so many weird and unsightly arrangements for guarding Post Office lines. My supply authority friends tell me that Post Office regulations render these necessary—or alternatively expensive underground arrangements, whereas, for ordinary road crossings, double standing, &c., is accepted legally and technically as quite sufficient to protect the lives, limbs and property of the public.

Efficient and inexpensive distribution is becoming increasingly necessary, and, moreover, the Weir Report actually recommends that "any statutory disabilities should be removed"—in order to realise the very considerable savings which could be effected by the use of up-to-date methods! I am open to correction, but is there not a red-tape worm here that wants scotching? VERMICIDE.

September 23rd.

All-electric Public Lighting

The Borough of Hastings can now claim to have "all-electric" public lighting. There are now only four small gas lamps in use fixed round the Albert Memorial which are lighted and maintained by the local gas company at its own expense.

At March 31st, 3,117 electric lamps were in use in 2,636 positions. A. J. RYAN,

Hastings, September 21st. *Borough Electrical Engineer*

Warming Buildings by Electricity

I was much interested in the article by Mr. J. Lesser on page 382 of the current issue of the ELECTRICAL REVIEW. I have a large house with central heating and domestic hot-water service employing crude-oil-fired apparatus, using approximately 1,500 gallons of crude oil annually at a cost of about £40, including maintenance and electricity.

I thought of cutting crude oil out by using electricity, and suggested automatic immersion heaters fitted into the hot-water cylinder. I have approached the supply authorities, who advise me that electric immersion heaters fitted in that way cannot be made an economical proposition. What does Mr. Lesser say to that? CRUDE OIL.

September 23rd.

Better Salesmanship Needed

No doubt the letter in your issue of September 22nd from Sir Harry Brittain, writing as a detached observer, will be duly read, marked, learned and inwardly digested by responsible managers of electricity undertakings, together with your pertinent editorial appeal to "get on with the job." The campaigns to secure grid load from lighting, domestic appliances and water heating, have abundantly shown the necessity for salesmanship, and for more and better salesmanship, and have demonstrated the benefits to be obtained by intensive and well-directed selling effort. The space-heating campaign will demand the exercise of somewhat more specialised technical skill by the salesman.

But for what reason is the attack on the largest potential load being the longest delayed? I refer to the power load. The results of the survey of the industrial power load disclosed by the recent paper at the World Power Conference by Messrs. H. Hobson, F. Forrest, and C. D. Taite, summarised in your columns of June 30th last, have revealed, in the decisive manner that only actual comparative figures can reveal, the backward state of our industrial electrification and the enormous amount of load available for the grid in this field.

The difficulties of the problems involved should, obviously, accelerate, and not delay, the essential massed attack. Selling electricity to a potential power consumer demands more than ordinary selling aptitude, however keen and enthusiastic; the problem of securing this load for the grid demands a particuar technical skill combined with good salesmanship. The solution is very seldom so simple as merely substituting an a.c.

The New E.D.A. Council

1. Mr. C. D. Taite. 2. Mr. W. McGill. 3. Mr. R. P. Sloan. 4. Mr. C. G. Morley New. 5. Mr. W. C. P.Tapper. 6. Mr. R. W. L. Phillips (representing the Central Electricity Board). 7. Mr. H. C. Lamb. 8. Mr. E. Morgan. 9. Mr. P. J. Robinson. 10. Mr. A. E. McKenzie. 11. Mr. E. J. Jennings (representing the I.M.E.A.). 12. Alderman B. J. Samels (Joint Electricity Authorities). 13. Mr. R. S. Downe (London Electricity Supply Association). 14. Mr. A. J. Fippard (Provincial Electricity Supply Association). (*Photographs Nos.* 1, 7, *and* 8 *by Lafayette; Nos.* 3-6, 9, *and* 11 *by Elliott & Fry;* 10 *by J. Russell & Sons;* 12 *by Mills & Kay;* 13 *by Navana; and* 14 *by the Gravure Co.*)

The two representatives of the Incorporated Association of Electric Power Companies have yet to be appointed

motor for a prime-mover, or for an existing d.c. motor. Study of the manufacturing processes and working operations very frequently reveals the possibility of advantageously installing individual drives, perhaps under automatic or semi-automatic control, resulting in an increased quantity or improved quality of output, and maybe an additional saving also in labour costs, sufficient not only to pay the whole power bill but also in a short period to recover the whole capital cost expended.

With well-defined exceptions, the conception and design of such new or conversion jobs, and the provision of modern control are necessarily a matter for the power specialist and are beyond the ability of a merely commercial salesman or small electrical contractor. If either of these has not the technical knowledge or experience to discover and present the economic solution, the sale of energy and equipment is lost; or worse still, unsuitable equipment is put in.

May I offer the suggestion that an advisory service, comprising a small staff of perhaps two or three technical men, well qualified in industrial power applications, should be set up by E.D.A., and made available for individual consultations on site, at the request of supply authorities' salesmen, or electrical contractors, or even of power users themselves? There should be no lack of experienced engineer-salesmen available, whom manufacturers—under the present conditions of absurd and suicidal competition—cannot afford to keep employed. With such a facility for bringing skilled assistance and unbiased opinion and advice to bear on actual power problems, not only would many of the admitted difficulties in the way of adding such loads to the grid be in a fair way towards a satisfactory solution but the results secured would be an invaluable guide and stimulus to any new Sales Association that might be formed in the future. A.M.I.E.E.

September 25th.

Supervision of Installation Work

While deploring the fact that it is true what "Stud. Inst. C.E." says, I should like to point out in defence of the harassed army of supply authority installation inspectors that many installations, although connected to the mains, have not, and never will, receive the blessing of the inspector.

It invariably happens that the electrical work of a large building or factory which is being rushed to completion for an opening date is not finished until the evening before, or the morning of, the great day. In order that production may begin or a ceremony proceed it is then essential that a supply shall be given and this is very difficult to refuse, as there is always the excuse that any alterations required by the inspector will be carried out. Once connection has been made, however, all interest evinced in the work, from the owner of the premises downwards, appears to depart, and the inspector is henceforth either laughed or cursed at. The powers possessed by him are not at all clearly defined, and the rules, particularly those applicable to factories and workshops, are capable of varying interpretation.

What seems to be required is a rule whereby the electrical equipment of a building, like the damp course and other essential features, has to be completed a certain specified time before that building is put into use, this period to be progressively extended each time an infringement of rules is found in the electrical installation. The status of the inspector should also be such that he receives the full and absolute backing of his executives. B. AND B.

September 23rd.

"Stud. Inst.C.E.," in his letter of September 19th, does not exaggerate in the least the danger to contractors, of the "cut-price." But it is just possible that his suggested cure would be rather too academic to be a working proposition. There are numbers of reliable, but wholly practical, installation contractors who would have but little time for the systematised study necessary to pass the A.M.I.E.E. examination and, in their modest way of business, to employ supervision so qualified would be as ill-advised as taking a suite of first-floor offices.

My experience has shown me that price-cutting, no matter how far-reaching are its evil effects, generally emanates from surprisingly unpretentious sources, *viz.*, the "young" contractor of doubtful training, who does not scruple to use "cheap" materials, and the "spare-time man" who is always doing jobs out of consideration of some hazy connection with his client's family, clearing himself with the price of a few "smokes." It might seem ridiculous to consider either of these as offering formidable opposition to the *bona-fide* contractor, but, on the contrary, their unreasonable estimates receive a great deal of domestic publicity and with the help of hard times a very harsh standard is set. Then, unless the *bona-fide* contractor conforms to that standard he is forever damned as a grasping rogue.

Combined action by private or municipal supply authorities and the Contractors' Association is the real way to tackle the "cut-price" menace. If only the supply people were more eager to give the public a guide to the installation problem—the limits of a reasonable wiring charge—the very weight and impartiality of their position would lead to a more sympathetic understanding on the part of intending consumers of electricity. At the same time, when asked to connect up to private work, let them introduce a little of their assisted-wiring-scheme severity, and make it known that no installation will be serviced unless done by contractors of proved integrity.

Far from carrying the installation contractors on their back the power companies and municipal supply authorities would only be doing a little towards protecting the interests of those whose zealous groundwork adds more than a few odd kilowatts to the annual "load." After all, the contractor ends his jobs with limited profit or varied loss, but the consequent flow of units, like Tennyson's brook, goes on for ever.

CUTHBERT H. C. STANLEY,
Sales and Contract Supervisor, James & Whiting.
Newport, Mon., *September 25th*

The Heating of Lampholders

Mr. Mortimer Hawkins has opened up a very interesting discussion, concerning bakelite lampholders.

I anticipate that manufacturers will need to undertake a considerable amount of research in bakelite compounds to produce a satisfactory lampholder of the insulated type, which will be free from expansion and cracking.

Twelve months ago I found myself in the same position as the writer, having some 200 fittings to deal with, each equipped with bakelite holders, 100-W lamps and enclosed shades, for the same apparent reason as Mr. Hawkins. In my case, however, I discovered that the fittings were badly ventilated, so much so that the flexes were scorched up. This is a difficulty which manufacturers as a whole will have to overcome, especially with the more modern and ultra modern designs of fittings. I feel quite safe in saying that 60 per cent. of the fittings which I have inspected, both British and of foreign origin, were either badly ventilated or without any provision for ventilation.

Although I have been writing of my experiences with regard to enclosed fittings, I have had the same trouble as Mr. Hawkins with open shades and 100-W pearl lamps. Even on temporary work of about six weeks' duration, I have found it impossible to remove the shade carrier ring or the assembly ring. I shall be pleased to hear other views on the subject.

Chelmsford, *Sept. 19th.* C. F. WHITE.

I have only to-day seen the letter by Mr. Hawkins about bakelite lampholders in your issue of September 15th, and as one of the pioneers in the design of these lampholders I think my views might be of interest to you. I have previously mentioned in this column that there is a difference between one bakelite lampholder and another, and it is impossible to enumerate the differences here without being suspected of using this correspondence as self-advertisement.

The chief trouble with bakelite holders at the present time is that the large majority of them are sold at too low a price, with the result that they cannot be produced at such a low figure without sacrificing their efficiency. If there is a call for a bakelite holder which will stand up to a 150-W lamp burning up to twenty-four hours it is obvious that such requirements are incompatible with the needs of other people with regard to a low price.

There are quite a number of details, including the quality of the material as well as the design itself and dimensions which make for a reliable holder, and my firm has no fewer than five different types of cord-grip, shade-carrier holders, according to the various requirements and, while I cannot speak for other manufacturers, should we receive an inquiry for bakelite holders we should weigh up the particular requirements and offer the one which we thought was the most suitable.

R. NETTLE,
Manchester, *Managing Director*, Victor H. Iddon, Ltd.
September 25th.

To Works Managers and Others

I read with interest the letter by "Anonymous," published in your issue of September 22nd. I am afraid that the writer is very unworldly, and has never heard of the law of supply and demand; one cannot expect employers and managers to give greater freedom to employés when there are hundreds of men willing to take any position which may fall vacant. At the present time there is a tendency to abolish any concessions which may have been granted during more prosperous times and it is useless to hope for any alteration until business improves. LOGIC.

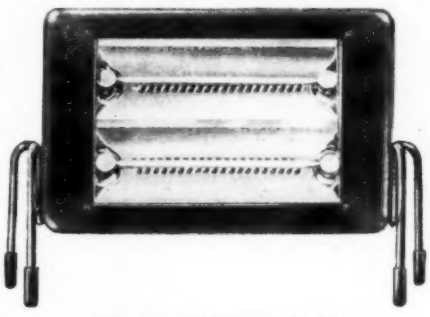
September 25th.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

A New "Inventum" Fire

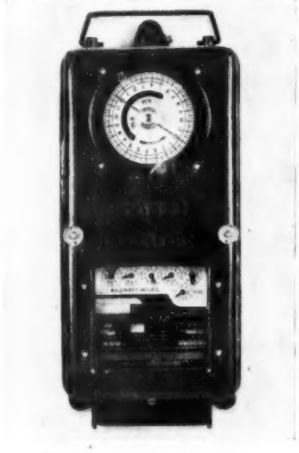
This year's addition to the fires made by INVENTUM ELECTRICAL APPLIANCES, LTD., Northend Road, Wembley Park, Middlesex, is "No. 1022," a rectangular reflector fire with rounded corners, and fitted with two bar elements supported throughout their entire length. Two loadings are available — 1,000 W or 1,400 W, and the weight is 8 lb. Three finishes in enamel can be obtained—red and black, dark red and black, or olive green, and the price is £2 10s. in each case.



The new "Inventum" fire

Combined Time-switch and Meter

The Venner "Rebater" consists of an a.c. watt-hour meter and a synchronous motor-driven time-switch mounted in one case, and is particularly suitable for water-heating installations and other purposes where specially low rates are given and where a time-switch is essential to ensure that the load is on circuit only during specified "off-peak" hours. The "Rebater" combines these two instruments in a compact and inexpensive manner, the time-switch and meter being connected in series inside the box so that external wiring has only to be connected to one four-way terminal block.



The Venner "Rebater"

Two sizes are provided as standard (10 A and 20 A), each size being supplied either with a switch making and breaking once per day, or, alternatively, three times a day. With the latter type, switching arms can be superimposed to eliminate any operations subsequently not required. A selective device to omit any day or days can be supplied; and the dimensions are 13 in. by 6 in. by 5½ in. The manufacturers are VENNER TIME SWITCHES, LTD., Kingston By-Pass Road, New Malden, Surrey.

New Installation Equipment

MESSRS. WM. SANDERS & CO., Falcon Electrical Works, Wednesbury, inform us that they have recently introduced a new "Sandalite" splitter rated at 15 A, 250 V, which is a further development of the "Sandalite" combination embodying the well-known "Sandalite" fuse and switch movement.

Another new product is a 30-A, 250-V "Sandalo" combined switch and fuses, arranged for cable entry either top or bottom. In all cases ample wiring space is provided, and both electrically and mechanically it is claimed to be exceptionally efficient. The bushed holes are clearance size for conduit, and the price is 10s.

A new "Sandalo" fuse-board, rated at 30 A, 250 V, and embodying the same fuse unit as that contained in the "Sandalo" combined switch and fuses, is mounted on removable and tilting battens and has detachable end plates. The prices are 19s. 4d. for the two-way type, and 5s. extra for each additional way up to ten.

Improved Radio Batteries

High tension batteries for wireless sets are being sold in greater numbers to-day despite the fact that within the past year or two sets which derive their operating power from the supply mains have loomed much larger in the programme of manufacturers of wireless sets than ever before. Compared with the batteries marketed only twelve months ago the new types are greatly superior.

A new range of h.t. dry batteries introduced by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C., is made up of super-insulated cells, minimising creepage and the possibility of cell-to-cell "shorting"; are absolutely silent in operation; have a uniform discharge throughout their life; have low internal resistance; and are type-tested and guaranteed in milliwatt-hours. Tests are made at every stage in the manufacture of these batteries to assure that they comply with the stringent predetermined standard set for them, and each one is wrapped in a cellophane outer cover to render them impervious to the effects of dampness.

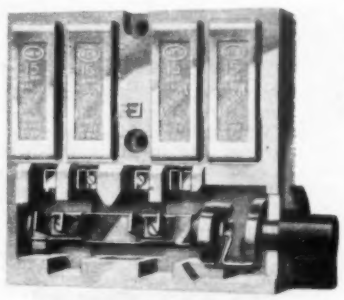
The new "L.260" battery

There are several models, ranging from the L.250, 60 V, 72,000 mWh at 5s. 6d. to the L.259, 150 V, 180,000 mWh at 14s., and the L.260, 60 V, 216,000 mWh at 14s.

An All-insulated Switch Splitter

The ironclad pattern of switch splitter has been in extensive use for several years, but the MIDLAND ELECTRIC MANUFACTURING CO., LTD., Barford Street, Birmingham, 5, has now introduced an all-insulated model known as the "Meminx," which can be used on all systems of wiring without earthing.

The switch movement and fuses are mounted in a strong porcelain base, the cover is of "Memite" black insulating material, and is interlocked with the switch handle. The action is quick make and break. Each "Kantark" fuse is of the same capacity as the switch, so that the load may be split into any convenient and widely differing values. The company has also drawn our attention to the fact that the new "Memette" ironclad switches comply with the Home Office regulations, the conduit actually entering the switch case.

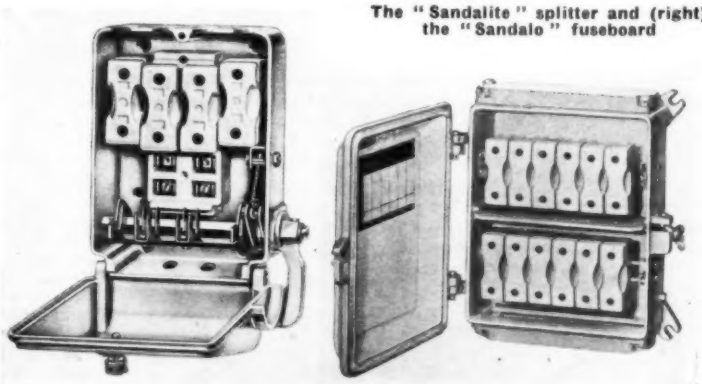


The "Meminx" switch splitter

New "Tong-Tests"

The two original models of the Crompton "Tong-Test" which were introduced a couple of years ago have found a very ready market, and revealed a demand for additional types. Two new patterns have recently been introduced. These differ from the earlier models in the shape and size of the tongs. In other respects they are similar—light and handy instruments of the split electro-magnet type for measuring a.c. and d.c. quantities without making electrical connections.

The new type "C" has a rectangular opening between the tongs, large enough to encircle porcelain fuse handles, and cables up to 2½ in. in diameter. It is particularly suitable for measuring the current in the various circuits of unit feed pillars. Type "D" has a square opening and will take cables, busbars or fuse carriers up to 3½ in. diameter. These models, like the original ones, are supplied with interchange-



The "Sandalite" splitter and (right) the "Sandalo" fuseboard

able movements, the standard ranges being, in the case of type "C," up to 75, 100, 200, 300 and 400 A, and in the case of type "D" up to 100, 200, 300 and 400 A. The first scale marking on each movement is one-tenth of the maximum reading. The instruments weigh approximately 2¾ lb., and can be held and operated with one hand.

The two new models can be supplied with ebonised tongs if desired, and thus made suitable for use on bare conductors, particularly when these run close together or in close proximity to earthed metal, the ebonising reducing the risk of a short circuit or "earth." A moulded bakelite handshield is fitted between the handle and the aluminium frame, so that when there is no risk of short-circuiting adjacent conductors it is unnecessary to employ models with ebonised tongs.

The type "D" "Tong-Test"

An interesting, if involuntary, test of the strength and stamina of the "Tong-Test" occurred recently in New Zealand when a "C" type instrument was closed in error round the main incoming circuit (1,500 A at 480 V d.c.) in a street pillar. The testing officer was compelled to remain holding an unsupported instrument with 480 V bare metal above, below and on either side until the back assembly of the pillar had been dismounted and the tongs forced open by a tommy bar inserted in the joint. When the instrument was tested later it was found to be absolutely undamaged.

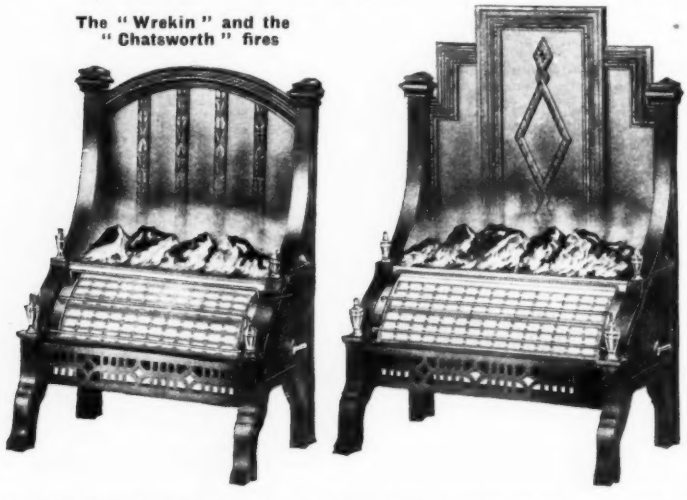
The makers are MESSRS. CROMPTON PARKINSON, LTD., Bush House, London, W.C.2.

"Class B" Valves

Modern valves and loud speakers make a heavy call on the h.t. battery if really good reproduction is to be obtained.

It is to mitigate this drawback that "Class B" amplification has been introduced, in which the anode current of the last valve varies in accordance with the volume of the output, thus conserving current during intervals. New "Class B" (B.21) and driver (L.21) valves have been introduced by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2. At 150 V (−6 V grid bias) the total standing anode current is only 2.2 mA, while at 100 V (−3 V grid bias) it is 1.75 mA. The B.21 is priced at 14s.

The "Wrekin" and the "Chatsworth" fires



A New Hair Dryer

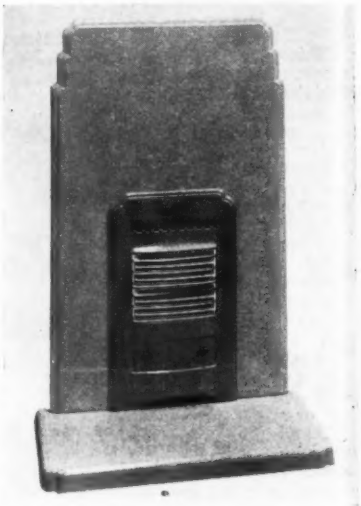
MESSRS. A. VANDAM & CO. (1933), LTD., Caxton House, Westminster, S.W., announce that they have just introduced a new hair dryer known as the "Invicta." It is priced at 33s. and can be used on d.c. or a.c. mains with a periodicity of 40/60 cycles. The casing and handle are of bakelite, and there is a nickel-plated nozzle protecting the element.

The "Invicta" hair dryer

"Falco" Fires

The latest additions to the range of fires made by the FALKIRK IRON CO., LTD., Falkirk, are the portable "Trilite" log fire (No. 382) and four "Falco" mantel fires. The former has a 2-kW heater under the canopy, each heater bar being separately controlled. The measurements are 15½ in. wide by 22 in. high by 8½ in. deep, and it is priced at £4.

The mantel fires are all of similar design to the model shown in the accompanying illustration, and prices vary from £4 5s. to £6, according to finish. In each case the fire is of the inset type, with horizontal elements and foot-operated switches in front, below the elements. The illustration shows No. 602, a 2-kW model, priced at £4 5s. in "Aligloss" vitreous enamel colours, and £5 15s. in "Verosa" standard colours.



A "Falco" mantel fire

"Spartan" Flush Switches

MESSRS. J. H. TUCKER & CO., LTD., King's Road, Tyseley, Birmingham, inform us that the "Spartan" range of switches has been extended to include flush switches complete with box. The standard all-insulated brown model (one section) costs 16s. per dozen, and finished in white the price is 20s. 4d.

Imitation Coal Fires

A new range of imitation coal fires has been introduced by MESSRS. JOHN SHAW & SONS, WOLVERHAMPTON, LTD., at £3 15s. and £4 15s. The former models, known as the "Warwick," "Bewdley" and "Wrekin" are all 2-kW types, and differ only slightly in design, as in each case the position and housing of the elements is the same as that of the "Wrekin" which we illustrate here, although the actual pattern on the panel above the imitation coal is varied.

The "Chatsworth" and the "Berkeley," both priced at £4 15s., and loaded at 3 kW (two heats), are designed on similar lines so far as the actual fire is concerned, but again the shape of the rear panels differs considerably. The measurements of the 3 kW models are 18 in. wide by 26 in. high by 10½ in. deep, while those of the 2-kW model are 15 in. wide by 23 in. high by 10½ in. deep.

New "J. & P." Products

Two of the most important uses for electricity are the electric vacuum cleaner and the electric iron. In the past these useful appliances have been in the habit of failing (generally when most needed), due to fracture of one or both of the conductors of the flexible supplying the necessary current, owing to repeated bendings or to undue stress continually placed on the wire.

Messrs. JOHNSON & PHILLIPS, LTD., Charlton, S.E.7, have produced a flexible ("Stronkor"), for use with domestic appliances in which the conductor is in the form of a metal braid which is woven around a hard cord centre. When this conductor is connected up the connecting screw clamps both the wire and the cord, the latter being automatically anchored and thus takes any stress placed upon the flexible. Flexibles manufactured with "Stronkor" conductors can be supplied in many different types; there is a tough-rubber-sheathed and braided type (non-kinking flexible), and a cheaper variation dispensing with the tough-rubber sheathing. The flexibles can also be supplied with tough-rubber sheathing having variegated colours on the outside, known as "marbled" or "chameleon" finish. This outer covering gives a very distinctive appearance to the flexible, but costs more than the standard article.

As a variation to the well-known systems of wiring usually employed, Messrs. Johnson & Phillips are now supplying a system which is largely used in India. This is a departure from the standard flat tough-rubber-sheathed house wiring cable; the conductors are insulated with pure and vulcanised rubber, or vulcanised rubber only, to standard dimensions, but the tough-rubber sheathing, instead of being applied in the usual flat formation, takes the form of a figure eight. The advantage claimed for this type of wire is that, when it is desired to separate the two wires for connection to separate points, it is only necessary to slit the sheathing between the two cores. The result is that each wire is then found to be separately covered with tough-rubber sheathing as well as the original insulation.

Long-distance Boiler Readings

A new water gauge projector

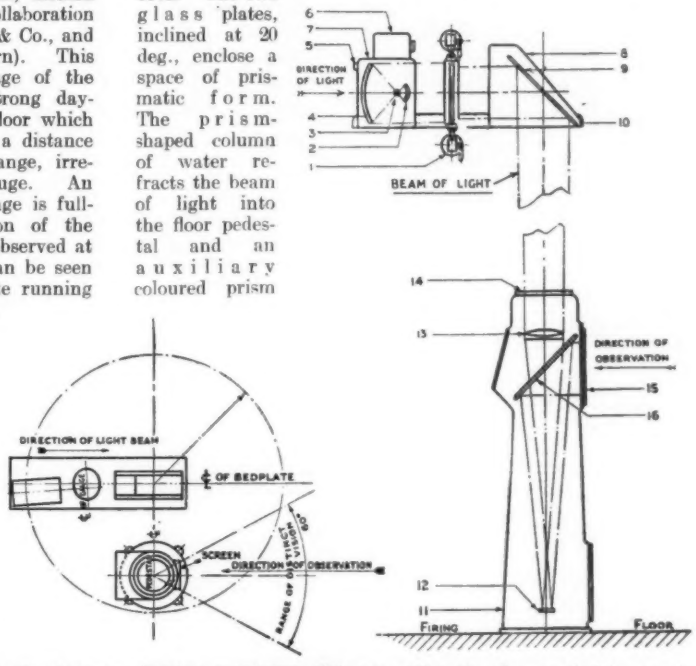
THE gauge glasses of boilers in modern power stations are often some 50 ft. or more above the firing floor so that the water levels cannot be kept under observation by the attendants. A new type of instrument has been designed by Messrs. C. A. Parsons & Co., Ltd., Heaton Works, Newcastle-on-Tyne (in collaboration with Sir Howard Grubb, Parsons & Co., and the inventor, Mr. C. L. Blackburn). This provides a clear illuminated image of the gauge glass (easily visible in strong daylight) at eye level on the firing floor which can be efficiently observed up to a distance of 40 ft. over a wide angular range, irrespective of the height of the gauge. An important feature is that the image is full-sized and precise in its definition of the water-level. When the image is observed at close range, convection currents can be seen in the water space and condensate running down the glass in the steam space.

Pedestal for Parsons water-gauge projector

The Parsons water gauge projector consists essentially of two parts: (1) A projector lantern and upper reflector, mounted on a steel bedplate adjacent to the water gauge; and (2) a cylindrical floor pedestal with a body of fabricated steel containing the optical image-forming system and the diffusing screen on which the image is formed. The lantern gives a uniform horizontal beam of light which, after passing through the water gauge, is reflected downwards by the upper reflector into the pedestal. The pedestal can be offset from the normal by an amount depending upon the height of the gauge from the firing floor. The horizontal beam of light from the lantern should be in the opposite sense to that from which the image is received on the firing floor. Component parts can be readily adjusted, but, once set, the adjustments are maintained.

The 48-W projector lamp is placed at the focus of a parabolic mirror from which a parallel beam of light is reflected and passed through the gauge. The lamps are supplied from the lighting system through a tap-regulated transformer which steps down the pressure to 12, 11 or 10 V to give the lowest voltage requisite for efficient operation.

To prevent confusion between a full and empty gauge glass, definite distinction between the steam and the water is desirable. This distinction is conveyed in the gauge developed by Messrs. Dewrance & Co. and Mr. C. L. Blackburn, which was described in the ELECTRICAL REVIEW of November 11th, 1932. The two glass plates, inclined at 20 deg., enclose a space of prismatic form. The prism-shaped column of water refracts the beam of light into the floor pedestal and an auxiliary coloured prism in the lantern merges a red beam into the steam space, and the image formed on the screen shows the steam in red and the water in brilliant white. The construction of the gauge is on the lines adopted for high-pressure glass-plate gauges, permitting the use of mica sheets for protecting the glass from etching.

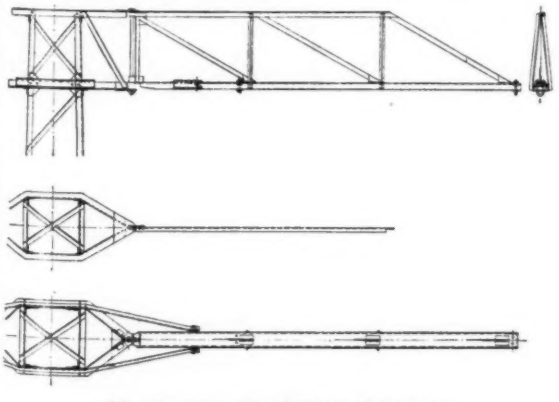


Left: Diagram showing maximum distance which the floor pedestal may be offset from the centre line of the upper reflector. Right: Arrangement of projector lantern, upper reflector and floor pedestal

1. Boiler water level gauge. 2. Reflector. 3. Lamp. 4. Parabolic concave mirror. 5. Junction box. 6. Step-down transformer. 7. Projection lantern. 8. Upper reflector casing. 9. Plane mirror. 10. Bedplate. 11. Floor pedestal. 12. Convex mirror. 13. Object glass. 14. Plateglass dust cover. 15. Diffusing screen, showing brilliant image of gauge glass. 16. Lower reflector.

A Novel Hinged Cross-arm

THE special feature of the hinged cross-arm shown in the accompanying illustration, from *Elektrotechnische Zeitschrift*, lies in the use of auxiliary bracing pieces, which normally render the hinge inoperative, but fail by bending or buckling when a predetermined torsional load is imposed on the structure by the breakage of conductors. This construction, patented by the Brown, Boveri Co. (German Patent No. 495,821), has given satisfactory service in numerous applications in Germany and other countries. The mast itself is not specially designed to withstand torsion, but the construction of the cross-arm and its connection with the mast are such that, in the event of a conductor breaking, the torsional resistance of the mast is utilised up to the permissible limit. When this limit is reached, the hinge-bracing pieces give way and the cross-arm can turn about its hinge. The work done in deforming the bracing pieces constitutes a damping action which protects the mast, insulators, and conductors from impact stresses.



The cross-arm described in these notes

Tests on an experimental double line with three conductors per cross-arm showed that, after cutting two of the conductors on one side, between masts Nos. 3 and 4, the movement of the hinged cross-arm on mast No. 3 occurred slowly and uniformly, neither the cross-arm nor the suspension insulators deflecting beyond the final position of equilibrium; at the same time, the cross-arm on No. 2 mast, at the far end of the adjoining span, deflected only about 25 deg. These observations have been confirmed on lines in service. When repairing the line it is only necessary to bring the hinged cross-arm back to its normal position, the deformed bracing pieces being replaced then or later, as may be more convenient. Fixed suspension clamps being used, no readjustment of the conductors is required. Slipping or friction suspension clamps are unnecessary owing to the damped movement provided by the cross-arm hinge and bracings.

Compared with the use of rigid cross-arms, the new construction is claimed to combine increased security with lighter masts, smaller foundations, and reduced capital and maintenance costs. Also, the hinged arm behaves as a rigid arm until the limiting horizontal load is reached, hence erection is facilitated and the cross-arms are not deflected by wind along the line or by differences in the stress in adjoining spans due to temperature variations.

The new cross-arm is claimed by the makers to be applicable to masts of steel lattice, wood, or reinforced concrete, and it can often be applied advantageously to existing masts, particularly where pin insulators are to be replaced by the suspension type.

Researches in Copper and Aluminium

The silver jubilee meeting of the Institute of Metals

THE autumn meeting of the Institute of Metals, which was held at Birmingham from September 18th to 21st, was the silver jubilee of that body. We commented on this aspect of the present conference in our leading columns of September 15th. Of the fourteen papers presented, those of chief electrical interest related to developments in copper and aluminium.

In a report on the annealing of h.c. copper wires, Messrs. W. E. Atkins and W. Cartwright state that annealing behaviour depends not so much on the original tensile strength of the wire as on the amount of reduction by cold work which it has undergone; this is expressed as "work ratio"—diameter at intermediate annealing divided by final diameter.

The wire used was silver-free 99.95 per cent. copper drawn into 0.104-in. wire, intermediate annealing being introduced in such a way as to furnish eleven coils of wire varying in breaking load from 399 to 544 lb., and with reductions of area after annealing of from 36 to 97 per cent. Samples were annealed for periods varying from ½ to 24 hr. at temperatures from 130 to 280 deg. C., and for half an hour from 330 to 850 deg. C. Mean breaking loads after each heat treatment are published.

The more lightly drawn wires show an appreciable increase in strength after annealing at low temperatures. They retain their strength at temperatures up to, say, 250 deg. C. very much better than the harder wires; the latter begin to soften at temperatures little above 100 deg. C., and the rate at which strength is lost increases with increasing cold-work. The hardest wires all show a definite decrease in breaking load after storage for two years at room temperature; the more lightly drawn wires show no change. This apparent differentiation is again suggested by the breaking load/temperature curves from 450 to 850 deg. C.; the lightly drawn wires decrease slightly but steadily in strength with rising temperature, but all the harder wires without exception have higher breaking loads after annealing at 750 deg. C. and again at 850 deg. C. than they have after heating at 650 deg. C.

Mr. N. P. Allen found that the distribution of porosity in aluminium and copper ingots followed the probable form of the isotherms in the cooling mass and was much influenced by the mould taper and the type of micro-structure. The bases of the investigation were three copper and four aluminium alloy ingots cast in a specially tapered mould.

In a contribution on temper-hardening copper alloys Messrs. H. W. Browndson, M. Cook and H. J. Miller state that, when nickel and aluminium are present in certain quantities and ratios, the hardness and other mechanical properties of the alloys are softened by quenching from high temperatures and harden considerably when reheated to a temperature below the annealing point.

The corrosion-fatigue characteristics of aluminium consisting of two crystals was tested by Messrs. H. J. Gough and D. G. Sopwith under alternating torsional stress in a slow stream of tap water for six weeks. The intercrystalline boundary was not attacked and did not visibly influence the method of failure of the specimen, which occurred primarily by the formation of cracks in areas undergoing heavy plastic deformation. The cracks originated in several cases at holes (the origin of which is not known) in such areas. The formation of oxide film and the small pitting which took place did not appreciably contribute to the failure.

The constitution of aluminium-rich aluminium-copper alloys above 400 deg. C. has been investigated by Mr. D. Stockdale using the micrographic method. A considerable range of solid solutions has been found, but no evidence of the existence of $CuAl_2$. The results obtained by Dix & Richardson on the solubility of copper in aluminium have been closely confirmed. Mr. W. H. J. Vernon compared the green patina on copper from a structure in mid-Wales, which contained 20.75 per cent. basic copper chloride, with that from a spire at Dundalk, on the east coast of Ireland, which contained 8.15 per cent.: this difference is attributed to the influence of prevailing winds. Basic copper sulphate constituted the bulk of the deposit in each case, relationship of formula with period of exposure confirming the conclusions of previous work.

In "Some Steps in Metallurgical Progress, 1908-1933," Mr. W. Rosenhain briefly reviews some of the more important developments since the inauguration of the Institute, including the study of metals by X-rays and electron refraction, and the protective surface film and its isolation.

Electricity Supply and Traction in India

THE fourth edition of "The Law Relating to Electrical Energy in India," by Mr. J. W. Meares, C.I.E. (pp. 425. Calcutta: Thacker's Press & Directories, Ltd., 24s.) has been revised throughout and considerably enlarged. The first edition was published in 1910. The author, in his capacity as Electrical Adviser to the Government of India until 1922, took an active part in framing the legislation governing supply and in drawing up the rules for its application. He gives the full text of the Indian Electricity Act of 1910 (superseding an Act of 1903) as amended by five subsequent Acts, and of the Indian Electricity Rules of 1922, with such modifications as developments have made desirable (including in an addendum changes made after the work had gone to press), and many useful notes on practical points.

The general approach to the subject is that of an engineer, and nearly half of the book is devoted to an explanation of the bearing of the statutory provisions upon practical problems. Thus we find a discussion of what is the point of delivery to a consumer—a matter of importance in settling responsibility for damage due to fire, &c. This is defined in the Rules to be the point at which the service conductor enters the meter or, where no meter is installed, the service cut-out, but Mr. Meares holds the view that it should be the cut-out in any case, which appears more logical.

The provisions permitting compulsory reductions in charges by the Government on the recommendation of advisory boards appear not to have worked well in practice, due presumably to the difficulty of getting representatives of informed opinion, free from local bias, on the boards. An anomaly of the existing law is that the trolley bus does not come under the Indian Tramways Act of 1886, but under the Indian Motor Vehicles Act of 1914, as the former covers only systems involving the use of rails.

Hydro-electric Undertakings

The 42-page index is most comprehensive and its arrangement makes reference to important points an easy matter. Not the least interesting part of the work is the introductory chapter which summarises the present position of electricity supply in India, written in a way that will make it understandable by the non-technical reader. Reference is made to the hydro-electric surveys carried out by the author as chief engineer in 1921 and later by some of the State Governments, particularly the Punjab and Madras. Bombay was earlier than the latter with its chain of hydro-electric plants on the Western Ghats, which use stored water without flow for half the year—probably a unique condition.

The cotton mills of Bombay and the jute and cotton industries of Bengal have profited greatly by the even turning movement of the electric motor. The large number of small electric fans in use is one of the chief factors in success of electrical undertakings owing to their long working hours.

In railway electrification Bombay has led the way with the B.B. & C.I. and the G.I.P. Railways. There is room for improvement on the local lines in Calcutta, but elsewhere Mr. Meares believes that the density of main line traffic is too low to warrant electrification. Considerable scope should be open for the electric working of mountain railways supplied with water power in the vicinity, e.g., the Nilgiri and the Kalka-Simla railways.

Supply Statistics

The latest returns of electrical undertakings were compiled last year and related to 1929-30, but these are incomplete. They give the capital expended at the end of the period as Rs.39,37,46,910, the kW of generating plant installed at 417,945, and the kWh generated as 927 millions. In the opinion of the compiler, Mr. F. L. Milne, these figures should be about doubled to give the total for all undertakings in India and Burma. Bombay comes first of the provinces with Rs.24,28,14,136, 196,153 kW and 520 million kWh.

In 1927-28, when the total capacity of generating plant installed in British India, excluding military plants and Bihar, was 325,000 kW (294,000 a.c. and 31,000 d.c.), 187,000 kW was steam, 14,000 oil and gas, and 124,000 water plant. Statutory companies owned 314,000 kW, local authorities 6,000 kW, Government concerns 3,000 kW, and non-statutory companies 2,000 kW. There were some 140,000 consumers with a connected load of 360,000 kW and 3,500 kW in public lamps. About 700 million kWh was generated and 600 million sold.

Electrical Notes from Canada

FROM OUR TORONTO CORRESPONDENT

THE British Columbia Electric Railway Co. and the Hydro-Electric Power Commission of Ontario have in recent months taken somewhat similar steps to find loads to replace the falling-off in industrial supplies during the past year or two. Both of these supply authorities have instituted systems of furnishing householders with electric water heaters, completely installed, at no initial cost to the consumer—the return will come in increased consumption of electricity at high load factor.

The response of the public in both provinces appears to have been gratifying to the promoters. The present business depression has shown very clearly that the domestic load is far more stable than the industrial and commercial loads, and certainly in times like the present it is worth cultivating.

The British Columbia Electric Railway Co., in addition to supplying and installing water heaters free, is also installing (but not supplying) electric ranges without cost to the householder.

The Hydro-Electric Power Commission is prepared to supply water heaters in seven different capacities, ranging from 400 to 1,500 W. The rate charged for energy is relatively low, but varies according to the cost of power in different municipalities. As the Commission supplies power—indirectly, through the local distribution systems of the municipalities—to nearly 450,000 domestic consumers and as less than 10 per cent. of these had electric water heaters, there was a huge potential market available, a very small proportion of which, if it could be secured, would represent many thousands of heaters. In addition to increased sales of electricity, the scheme has provided work for several months now for a considerable number of men engaged in manufacturing, distributing, and installing these heaters and the advertising of the plan has no doubt helped printers and others to some extent.

Good Business!

The total number of heaters installed to date in four months is approximately 10,000, the average capacity being 750 W. The flat-rate heaters, which are those being installed free of charge, are equipped with a thermostat which cuts off current when the water has reached 190 deg. F. The Commission is also prepared to install booster heaters, the current being metered and a small carrying charge being made each month to repay the cost of supply and installation. These heaters are supplied where the householder wishes to be assured of an ample and quick supply of hot water at any time.

The Commission supplies in all cases a special box containing two single-pole switches with fuses; one switch serves for the flat-rate heater and the other is available to control a booster heater if one be installed either at the same time as the flat-rate heater or at some future date.

The Commission has recognised what a handicap to the development of the domestic load is the high cost of a three-wire service of ample capacity, and is seeking to reduce this cost substantially. The present cost is probably from $30 to $50, according to circumstances, and the Commission's engineers are hoping to be able to cut this down to less than $25 by using special cable and a cheaper type of service and distribution box. So much interest is being taken in England in electric water heating that I think it worth while citing these facts in some detail.

Discussing recent decisions of both the Ontario and Quebec Governments to substitute public works for direct help for the unemployed, *Electrical News and Engineering*, of Canada, points out that this affords municipalities an excellent chance to start putting unsightly overhead wires underground, at the same time reaping the benefits accruing from underground lines—improved appearance of the streets, elimination of damage to trees, immunity from trouble due to lightning, wind and sleet, &c. The city of Montreal is doing a lot of this work, which involves a relatively large amount of manual labour.

Electrical Imports

The United States Department of Commerce has recently published some figures of exports of electrical apparatus to Canada. The total value is over $8¼ million, showing that although Canada supplies a great deal of electrical equipment of all kinds from her own factories she is still quite a good customer of the United States. The period covered is the year 1932. Out of ninety-one separate classifications, the values of the Canadian imports of the twelve highest specific classifications are as follows :—

Item.	No.	$-Value. (approx.).
Radio receiving set components	—	774,000
Electric household refrigerators	5,964	402,000
Electric commercial refrigerators (up to one ton) ...	1,749	219,000
Parts for electric refrigerators...	—	633,000
Telephone equipment other than instruments and switchboards	—	298,000
Therapeutic and X-ray apparatus	—	237,000
Accessories and parts for motors	—	234,000
Domestic vacuum cleaners	32,042	211,000
Sockets, outlets, fuse blocks and lighting switches ...	844,842	192,000
Starting and control equipment for industrial motors	—	185,000
Electrodes for furnaces (lbs.)	2,431,756	181,000
Starting, lighting and ignition equipment	—	171,000

It is evident from the foregoing table that Canada buys a good deal of electrical equipment from the United States in the form of parts which are merely assembled in this country.

Indian Electrical Imports

THE Department of Overseas Trade has issued a survey of the import trade of India during the first three months of the current fiscal year (April-June) by the Senior Trade Commissioner in India. From this we have taken the following information relating to the electrical part of the trade. A lakh of rupees is equivalent to £7,500 (at the 1s. 6d. rate of exchange).

Although machinery imports as a whole showed a slight increase, purchases of electrical machinery fell drastically as compared with the corresponding period of 1932—from 44½ lakhs to 27 lakhs. It is noted that imports of this class from the United States were reduced.

The imports of electrical instruments and apparatus (including telegraph and telephone) decreased slightly from 60½ to 57 lakhs, but the decline in the United Kingdom's share was very small—from 32¼ to 32 lakhs. On the other hand, arrivals from the United States fell from 7 to 5 lakhs, those from Germany from 8½ to 5¾ lakhs, and Holland from 3 to 2¾ lakhs. Imports from Japan, however, rose from 3½ to 5¼ lakhs.

The total trade in electric fans fell from 8½ to 7 lakhs, the United Kingdom's share being reduced from 5 to 4.88 lakhs, that of Italy from 1.6 to 1.5 lakhs, and other countries from 2 to ½ lakh. Under the heading of electric wires and cables, the total imports advanced from 14 lakhs to 15½ lakhs, arrivals from the United Kingdom being slightly improved, from 10½ to 10¾ lakhs. Imports of Japanese cables increased from 1¼ to 2¼ lakhs, and those of the German product from ¾ to 1 lakh. Arrivals from Belgium also advanced from ¼ to 1 lakh.

The imports of gasfilled electric lamps rose from 3½ to 3¾ lakhs. United Kingdom shipments advanced from 1.8 to 2 lakhs, and those from Holland from 0.9 to 1 lakh. Imports of vacuum electric lamps totalled 4½ lakhs as compared with 4 lakhs last year. Arrivals from the United Kingdom advanced from 1¼ to 1½ lakhs, and those from Holland from 1 to 1.13 lakhs. Imports from Japan were steady at just under a lakh. The imports of bulbs for electric torches fell from over a lakh to half a lakh in consequence of materially reduced shipments from the United States, Japan, and Germany.

The total trade in batteries rose from 2.8 to 3 lakhs. It is remarkable that in this item the American share advanced from 1.4 to 1.8 lakhs, while that of the United Kingdom declined from 1 to ¼ lakh. Electric carbons, including furnace electrodes, remained stationary at just over a lakh, of which the United Kingdom supplied ¾ lakh and "other countries" the balance. The trade in accumulators rose from 2.6 to 2.75 lakhs. Here, again, the British share fell from 2¼ to 2 lakhs. Electric lighting accessories fell from 2¼ to 2 lakhs, the British shipments being reduced from ¾ to ¼ lakh and the German from 1 to ¼ lakh. The imports of meters totalling 2¼ lakhs were mainly drawn from the United Kingdom (2 lakhs). Imports of unenumerated electrical goods and apparatus fell from 11 to 9 lakhs, mainly due to reduced shipments from the United States from 3½ to 1½ lakhs. The United Kingdom's share advanced from 4¾ to 5 lakhs, while that of Germany fell from 1¾ to 1½ lakhs.

The total imports of radio apparatus rose from 2 to 3 lakhs, although the United Kingdom's share declined slightly from 1.5 to 1.4 lakhs. There was a material increase in arrivals from "other countries" (probably Japan) from Rs.5,000 to Rs.82,000.

Italian Electrical Imports and Exports

The imports of electrical machinery, apparatus and cognate material into Italy during the five months ended with May last attained a value of £663,365, as compared with £929,110 in the corresponding five months of 1932. There was also a decline during the same period in the exports of similar material from Italy, from £768,730 to £294,540.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

Henley Cable in Chislet Mine

The accompanying picture shows a "stand easy" during the installation of Henley "Herculene" shaft cable at the Chislet Colliery, Kent. The shaft is 1,320 ft. in depth, and a total length of 650 yds. 0.2 sq. in. 3,300-V cable was installed. One length of 350 yds. was lowered down the shaft, 120 yds. being laid along the pit bottom into the sub-station for connection to the switchgear. This length was then cleated every 30 ft. to the side of the shaft. Another length of 300 yds. was

"Herculene" shaft cable at Chislet Colliery

then lowered, 90 yds. being pulled back and laid into the power station at the pithead. This length was then cleated in a similar manner to the first length. A straight-through joint was made half-way down the shaft, the jointers working from the top of the cage, and another joint was made at the end box in the power station cubicle. The cable will convey power for driving coal cutters and drills.

The Copper Development Association

The Copper Development Association was registered on September 19th as a company "limited by guarantee" without share capital with 100 members. The objects are "to promote, with a view to increasing the consumption of copper, co-operation between persons, firms and companies, including those who are or may become members of the Association and who alone or in co-partnership or otherwise, carry on business as miners, smelters, producers, refiners, manufacturers, fabricators, and/or dealers in or distributors of, or are otherwise connected with or interested in, copper and/or copper containing materials, etc." The subscribers are Messrs. J. H. Allen, H. W. Clarke, A. Dando, H. C. Gibbins, G. W. Mullins, C. E. Prosser, and W. R. Williams, and the Amalgamated Metal Corporation, the Anglo Metal Co., Ltd., Thomas Bolton & Sons, Ltd., the British South Africa Co., Imperial Chemical Industries, Ltd., the London Electric Wire Co. & Smiths, Ltd., Metal Traders, Ltd., the Mond Nickel Co., Ltd., Mufulira Copper Mines, Ltd., Noranda Mines, Ltd., the Rhokana Corporation, Ltd., the Rio Tinto Co., Ltd., and the Roan Antelope Copper Mines, Ltd.

Markets for Radio Apparatus

The Department of Overseas Trade has published reports on the markets for radio apparatus in Turkey, Portuguese East Africa (Angola), and Egypt.

Dundee and Electrical Trading

At a meeting of Dundee Corporation Electricity Committee on September 18th, it was moved that the electricity manager be asked to report on the steps necessary to operate adequately the powers conferred by the Electricity (Supply) Act, 1926. These were to sell electric lines, fittings, apparatus, and appliances for heating, motive power, &c., and to install, connect, repair, maintain and remove these. Mr. Powrie said that since the Central Electricity Board was mainly supplying the country with electricity the Corporation had become more distributors than generators of electricity. It seemed to him that they could properly extend their activities under the Act. They should encourage the people to use the commodity the Corporation was selling. The motion was seconded. Mr. Blackwood, opposing, said it was a deliberate effort to cut the feet from every electrical trader operating in the city. It was moved that the motion be rejected, and this was seconded. Mr. Lockhart, convener, pointed out that Mr. Powrie's motion was covered by a motion previously made which had not yet been reported on, and Mr. Powrie said he would withdraw his motion if he received an assurance that the former motion would be dealt with. This was agreed to.

Proposed Marking of Electrical Goods in Australia

A proposal is under consideration in Australia whereby all imported electrical machinery and apparatus will have to bear an indication of the country of origin and the voltage and current at which they are designed to operate. Mr. White, the Minister for Customs, states that he is considering the issue of such a regulation as a result of representations by Australian manufacturers. It has been found on inquiry, he said, that the better class of electrical goods was already usually marked with an indication of voltage and current, but that the cheaper classes of goods were frequently not marked, were at times unsuitable for the use to which they were likely to be put, and were dangerous. The Minister is anxious to hear all sides of the question before taking action.

All-electric Houses at Brighton

The Lord Mayor of Bristol formally opened an estate of 280 Council houses at Whitehawk, Brighton, of the all-electric type, when in Brighton during the recent Bristol Week. These houses, of both two- and three-bedroom capacity, are the last under the present housing scheme authorised by the Corporation, and they let at 13s. and 14s. per week respectively, the rents including 2s. per week hire charge for electric cooker, kettle, iron, &c. The charge for electricity consumed will be ½d. per kWh. There is a plug in every bedroom except one in each house.

A "Goltone" Display Board

The accompanying illustration shows a display stand of bakelite components prepared by Messrs. Ward & Goldstone, Ltd., for the use of dealers. The overall size of the stand is 20 in. by 18 in., and it has an oak finish. There is a bracket support at the back, enabling it to stand alone; this bracket can be folded away if desired, and the stand hung up by a cord provided. Spring clips are fitted to take the various components. The board is supplied free of charge, the components only being charged for, and the quantity to be distributed is limited.

A "Goltone" bakelite component display stand

The Cottages in the Strand

The cottages which were erected on the Bush House site, Strand, from the winning design of the Building Centre Cottage Competition (one of which is "all-electric"), are to be closed to the public at the end of the month. They have been visited by the Prince of Wales, and many Government officials and housing authorities from all over Great Britain, and since June about 20,000 people have inspected them. As a result direct evidence is available up to the present, that about 500 such cottages are being built in various parts of the country by public authorities and private individuals.

Wages in the Cable-making Industry

The Joint Industrial Council for the Electrical Cable-making Industry informs us that there will be no cost-of-living alteration in wages in the industry on the third pay-day in October.

St. Joseph's Convent, Stafford

The recently rebuilt St. Joseph's Convent, Stafford, consists of a day school, nuns' quarters, priest's quarters, several guest rooms, laundry refectories, and chapel. Messrs. Blackburn, Starling & Co. carried out the electrical work. The laundry installation includes a 5-h.p. motor for driving the washing machines, a 2-h.p. motor for driving a mangle and exhaust fan, and several electric irons. The wiring throughout is in screwed steel tube concealed as far as possible, but exposed

on spacing saddles in the laundry and basement. The altar is floodlighted from two side brackets and the body of the chapel from eight three-light side brackets. These fittings were made by Messrs. Best & Lloyd to the design of the architects, Messrs. Sandy & Norris.

The Marking of Imported Clocks

Following the inquiry last July into the application of the British Clock Manufacturers' Association for an Order requiring the marking of certain imported clocks, movements, escapements, and synchronous motors, the Standing Committee (Merchandise Marks) has now issued its report (H.M. Stationery Office, 2d.). In this it is recommended that the following items shall bear an indication of origin on sale or exposure for sale: Clocks, including mechanically driven, electrically driven (from mains and batteries), electro-magnetically driven, and electrically wound types, and movements of such clocks with dials, by means of a durable mark applied to the face of the dial or to a metal plate or label riveted thereto, or where there is no dial to the front of the clock. Movements of such clocks without dials, with or without escapements, to be die-stamped, engraved or moulded in a conspicuous position on the backplate or on a metal plate or label riveted thereto, or where there is no backplate to the movement itself, the mark to be in a conspicuous position. Synchronous electric motors of the type commonly used for clocks and clock movements to be die-stamped, engraved or moulded in a conspicuous position on the motor or on a metal plate or label riveted thereto. With regard to stocks of goods in the hands of traders, the case will be met by permitting stocks to be marked with a label securely attached to each article. It is proposed that the Order shall come into force three months after it is made.

Block Battery Convention

A convention of Block service dealers and wholesalers was organised by the Northern Steel & Hardware Co., Ltd., in conjunction with Block Batteries, Ltd., and was held at the Houldsworth Hall, Manchester, on September 20th. There was a good attendance and the company was addressed by Mr. E. W. Sudlow, who outlined the policy of the company. Mr. Johnson, the works manager, who also spoke, described the production of the batteries, after which an interesting discussion took place.

Local Exhibition

An exhibition of electrical appliances for the home was held during last week at the Drill Hall, Otley, under the auspices of the Electrical Distribution of Yorkshire, Ltd., assisted by a number of leading appliance manufacturers. Cooking demonstrations each day aroused considerable interest on the part of people both of Otley and of surrounding Wharfedale districts. Local electrical contractors co-operated with the company in the show.

Ediswan Heating in a 16th-century House

What is, perhaps, one of the most comprehensive heating installations of its kind has just been completed at "The Kiln," the home of Mr. F. S. Blackwell, at Harrow Weald. "The Kiln" contains much panelling and timber, and it was essential that this should not be disfigured or damaged by the installation. The "Ediswan" low temperature heating system was chosen for the purpose by the responsible architect, Mr. Penfold. A load of only 18.5 kW proved ample to maintain the specific temperature in the 20,000 cu. ft. under consideration. Skirting panel heaters 6 in. deep and varying in length were used for the most part. Where no skirting boards were available, tubular heaters were fitted. In no case was it necessary to disturb the panelling. The heat in each room is thermostatically controlled; the main switching, however, is centralised on the ground floor near the kitchen. All the switches are clearly labelled and grouped. In the accompanying illustrations the panels can be seen under the windows and along the skirting under the wash-hand basin.

"The Kiln" has also installed an electric cooker, an "Ediswan" high-speed boiling plate, and an electric refrigerator.

The "Popular Pair" at Leyton

In connection with the recent Leyton Carnival, 105 decorated vehicles were entered, and among them was a motor van from Siemens Electric Lamps & Supplies, Ltd. This was dressed to draw attention to the company's lamps, and

The Siemens' "Popular Pair" in a carnival

on each side was a large cut-out of the "Popular Pair" kiddies. The van, which was awarded second prize, is shown in the accompanying illustration.

Conditions in Estonia

The British Consul at Tallinn reporting on the economic situation in Estonia as at the end of June last says that there is little cause for optimism at the present time in the general economic outlook in that country. The foreign trade in 1932 fell to 40 per cent. of the figure for 1930 and during the first half of the current year there was a further decline. Although the United Kingdom's share of the import trade is small there was an actual increase in the total last year. It is considered that there is room for improvement in the British share in a number of items, the imports of which are substantial, such as electric lamps, insulated wire and cable and radio apparatus.

Recent Contracts

Orders have recently been received by the British Thomson-Houston Co., Ltd., through Messrs. Mather & Platt, Ltd., and the Candy Filter Co., Ltd., for electrical equipment for the Southport and District Water Board. The electrical equipment involved consists of three 150-h.p. vertical spindle variable speed a.c. commutator motors for driving borehole pumps, with contactor panels for each motor, and also a main sheet steel panel switchboard. In addition, there are a number of smaller motors for operating compressors, including two smaller a.c. commutator motors in connection with the filtration plant and drainage pumps, &c., together with control gear. The whole of the electrical installation, including the erection and cabling work, and also the lighting of the station, is to be carried out by the B.T.-H. Co. This order follows one received last year by the company for somewhat similar equipment for service at the South Staffordshire water works. In this case the equipment, which is now in successful operation, included two vertical spindle a.c. commutator motors rated at 420 h.p., 810/680 r.p.m., and control gear.

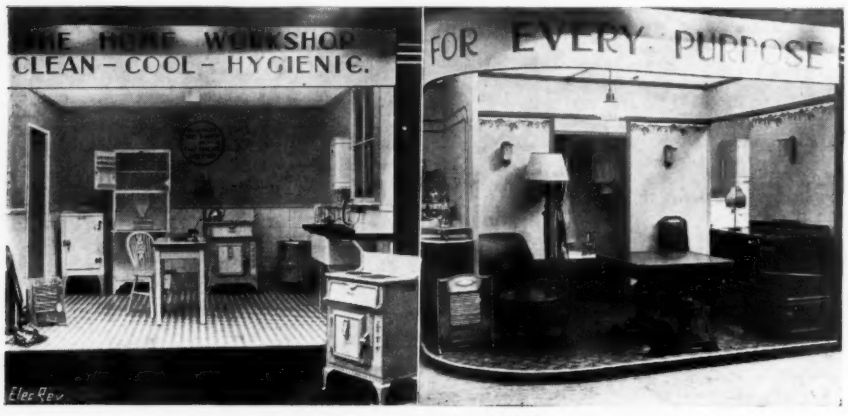
Ediswan panel heaters in a sixteenth-century house

"Beeantee" Illuminations, Ltd., informs us that it supplied a large quantity of "Beeantee" holders, rubber gaskets and cable in connection with the illuminations during the Brighton-Bristol week. It has also recently supplied material for illuminations for the Southend and Epsom carnivals, the Willesden and Dartford charter celebrations, and for the Barking bandstand. The company is also providing illuminations for the forthcoming charter celebrations at Fleetwood and

Finchley and for the Ludlow Shopping and Civic Week, while it has received a contract for similar material from the Barnsley Corporation.

Swedish Duties on Radio Apparatus

The General Customs Administration of Sweden, at the request of the Government, has investigated an application made by Swedish radio interests for the granting of increased protection against imports of foreign manufactures. The administration finds that the share of Germany in these imports has increased and it is recommended that counteracting measures should be adopted. An increase in the duties, it is submitted, should cover all kinds of apparatus, including component parts. In explanation of the situation the administration mentions that the value of the imports of radio-telegraph and telephone apparatus in 1931 amounted to 12.9 million kronen, falling to 7.56 millions last year owing, it is stated, to the general decrease in the purchasing capacity of the community. The imports were mostly from Germany and Holland.



The new showrooms of Barnes Electricity Department

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances :—

CHEMICALS, ETC.	Price, September, 27th.	Fortnight's Inc. or Dec.
a Acid, Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£40	—
a Ammonia, Muriate (large crystal) ... ,,	£38	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£19 15s.	—
a Potash Chlorate ... ... per lb.	3¾d. to 4¼d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac T.N. ... ... per cwt.	£3	—
a Sulphur Commercial... ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda Chlorate ... ... per lb.	3½d. to 3¾d.	—
a ,, Crystals ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d. less 6 per cent.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil... ... ,,	1/2 to 2/9	—
p Babbits Metal and Anti-fricton Metals—		
Grade I ... ... per ton net	£194	£1 dec.
Grade II ... ... ,,	£134	—
Grade III ... ... ,,	£66	—
c Brass (rolled metal 2" to 12" basis) per lb.	7¼d.	—
c ,, Tubes (solid drawn) ... ... ,,	9d. to 9½d.	¼d. dec.
c ,, Wire, basis ... ... ,,	7¾d.	¼d. dec.
c Copper Tubes (solid drawn)... ... ,,	10½d.	¼d. dec.
g ,, Bars (best selected)... ... per ton	£64	£2 dec.
g ,, Sheet... ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electroltyic) Bars ... ... ,,	£42	10s. dec.
d ,, ,, Sheets ... ,,	£64	—
d ,, ,, Wire Rods ... ,,	£46	£1 dec.
d ,, ,, H.C. Wire ... per lb.	7¾d.	¼ dec.
f Ebonite Rod ... ... ,,	1/3 to 1/6	—
f ,, Sheet ... ... ,,	1/3 to 1/6	—
n German Silver Wire .. .. ,,	2/2	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para fine ... ... ,,	4½d.	¼d. dec.
i Iron, Pig (Cleveland No. 3) ... per ton	62/6	—
i ,, Wire, galv. No. 1, P.O. qual. ,,	£20	—
g Lead, English Pig ... ... ,,	£13 5s.	—
g Mercury ... ... per bot.	£9 to £9 10s.	—
e Mica (in original cases) small ... per lb.	6d. to 3/6	—
e ,, ,, medium ... ,,	4/- to 8/-	—
e ,, ,, large ... ,,	8/6 to 17/6 & up	—
p Phosphor Bronze, plain castings ... ,,	1/1	—
p ,, ,, drawn bars & rods ,,	11d.	—
p ,, ,, rolled strip & sheet ,,	11d.	—
p ,, ,, wire ... ... ,,	1/0¼d.	¾d. dec.
o Platinum ... ... per oz.	£7 15s.	—
d Silicium Bronze Wire ... ... per lb.	8¼d.	¼d. dec.
r Steel, magnet, in bars ... ... ,,	7½d.	—
n Tin, Block (English)... ... ... per ton	£216 to £218	£2 dec.
g ,, Wire, Nos. 1 to 16 ... ... per lb.	3/5	—

Quotations supplied by :—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. R. Dennis & Co.

Trade Announcements

Messrs. R. J. Ede & Son, Ltd., have opened an electrical department in connection with their business at 35-36, Pound Lane, Canterbury.

Mr. A. J. Warner, electrical and radio engineer, has taken over the business of the late Mr. A. R. Fox, of The Bridge, Chippenham.

Mr. James W. Andrew has commenced business as an electrical engineer at 4, Regent Street, The Cross, Kilmarnock.

The Electric Installation Co. has opened new showrooms at 133, London Road, Chelmsford.

Henderson's Wholesale Electrical & Wireless Service has opened a new branch depôt at 12, Grove Road, Eastbourne.

Electrical Conduits, Ltd., of Walsall, has recently opened a branch at King Street, Norwich.

Messrs. E. R. Morton, Ltd., are removing to-day (Friday) to 11, Newman Street, W.1 (telephone : Museum 6616).

Messrs. Stillwell & Sons have removed to 153, Far Gosford Street, Coventry.

A New Dutch Lamp

Referring to the expiration in Germany of the tungsten lamp filament patents on October 6th, the report of the Dutch Incasso Bank states that the lamps made by the Philips Company of Eindhoven are included among those which are affected by the lapse of these patents. The bank states, however, that the Dutch company has brought out a new lamp for domestic lighting which is based upon new patents and success. Apparently the lamp is that to which the name of the " Bi-Arlita " has been given. At the same time the possession of other patents is said to protect the Dutch company against the advent of any possible new competition.

Cinema Lighting

At the new " Troxy " Cinema, Commercial Road, E., the lighting is carried out by means of metal and glass fixtures designed and built in as part of the general decorative scheme. A large number of positions are illuminated by means of laylights of suitable proportions (mostly 9 to 10 ft. long) and these laylights, whilst preserving harmony by a general resemblance, are given interest by variations of decorative detail; to ensure some degree of ceiling illumination the laylights are dropped slightly from the ceiling level.

The vestibule of the " Troxy " Cinema

The vestibule is attractively lighted; here the pilaster caps bear metal and glass fittings. A good effect is achieved in the main entrance hall, where a couple of pylon standards flank the main staircase, whilst from the centre of the ceiling is hung a five tiered pendant of interesting design in metal and wrought glass.

The whole of these fittings were made by Falk, Stadelmann & Co., Ltd., at their Birmingham works, to the designs of the architect, Mr. G. Coles, F.R.I.B.A. The installation work was carried out by the Strand Electric & Engineering Co., Ltd.

A British Trade Exhibition

A permanent trade exhibition of British goods was formally inaugurated at 1-3, St. Paul's Churchyard, E.C., on September 20th. The exhibition has been organisel by the *British Trade Review*, and is available for the products of its advertisers. Its object is to provide a meeting place where overseas buyers may inspect the actual goods of many British manufacturers under one roof. At present about forty firms are represented, but there is ample space for extension from time to time. The venture has received a good deal of publicity in the Colonial and foreign Press, and it is hoped to make it a rendezvous for foreign buyers too. It is also proposed to show goods for which there is a demand in various parts of the world, but

which are not at present made in this country, to stimulate the production of such articles by British manufacturers. The industries represented are varied, but the electrical section is not very strong at present.

Diesel Electric Tugs

The Diesel-electric tug, *Lectro*, which was built by Messrs. Henry Robb, Ltd., to the order of the Union Lighterage Co. for Thames service, was launched at Leith on September 21st. The two 360-h.p. Diesel engines were made by Messrs. Mirrlees, Bickerton & Day, and the generators, the 580-h.p. propulsion motor, and other electrical equipment by the British Thomson-Houston Co., Ltd.

Another tug of the same class is now undergoing trials at Middlesbrough. This is the *Acklam Cross*, which is claimed to be the first of her kind. The electrical side of the propulsion gear has been provided by the General Electric Co., Ltd. A picture of this vessel appears on page 437.

For Sale

Bury St. Edmund's Electricity Department has for sale one 1,000-kW turbo-generator with condenser.

(See our classified advertisements.)

The Still Engine Co.

The Still Engine Co., Ltd., has changed its name to Diesel-Steam Locomotives, Ltd., in order to indicate better its present activities.

Receiver Appointed

Mr. N. W. Wild, 42-45, New Broad Street, E.C., informs us that he has been appointed receiver and manager for the debenture holder of British Oil Cleaners, Ltd.

Catalogues and Lists

British National Electrics, Ltd., 5a, Berners Street, W.1.—A catalogue of the company's electric fires, cookers, irons and other domestic appliances, some of the illustrations being produced in colour.

Fredk. Thomas & Co., Ltd., 189 and 191, Drummond Street, Hampstead Road, N.W.1.—The latest catalogue illustrating "Efteelite" unit fittings for commercial, industrial and hospital lighting, together with industrial reflectors. Particulars are given of the new finishes which the company is now applying to its metalwork.

Brook Motors, Ltd., Empress Works, Huddersfield.—Price list No. 348 of vertical and flange-type motors, and No. 344 of "C" type squirrel-cage motors.

W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.—A folder illustrating the advantages of the Henley patent straight-through lead press as compared with the ordinary vertical lead press.

A folder drawing attention to Henley cables for electric welding.

Moulded Accessories, Ltd., 153, Great Hampton Row, Birmingham, 19.—A price list of moulded shockproof lampholders, ceiling roses, accessories and fittings.

Power-Gas Corporation, Ltd., Parkfield Works, Stockton-on-Tees.—Leaflet DR, illustrating and describing the "Dracco" dust-collecting system.

General Electric Co., Ltd., Kingsway, W.C.2.—Leaflet describing new h.t. batteries.

Edison Swan Electric Co., Ltd., 155, Charing Cross Road, W.C.2.—A 20-page catalogue describing the new season's fires. Publication No. G.909 giving particulars of the company's sales campaign for 1933-34, and L.907 illustrating in colour Ediswan lamp window displays and sales aids.

James Gordon & Co., Ltd., Regent House, Kingsway, W.C.—Pamphlet H.12 dealing briefly with the Hagan automatic control for steelworks and gasworks.

Sun Electrical Co., Ltd., 118 and 120, Charing Cross Road, W.C.—The 1933/4 catalogue (pp. 116) of radio receivers by leading manufacturers.

J. H. Tucker & Co., Ltd., King's Road, Tyseley, Birmingham.—An abridged price list (G.19) of switches, electrical accessories, and ironclad gear, including a number of new lines.

Williams & Womersley, Wakefield.—A folder giving particulars and prices of short centre endless V rope drives.

F. W. Lechner & Co., 61, Spencer Street, E.C.1.—A catalogue of "Kabi" radio components.

S. Wolf & Co., Ltd., 115, Southwark Street, S.E.—List BW6, illustrating, with brief particulars, electric drilling machines, and WLG1, dealing with the "Wolf" lathe grinder.

Babcock & Wilcox, Ltd., Babcock House, Farringdon Street, E.C.—Catalogue 1131 of Erith's Engineering Co., Ltd., describing the Erith-Roe marine type stoker.

A. Reyrolle & Co., Ltd., Hebburn-on-Tyne.—Pamphlet No. 862 containing illustrated particulars of domestic electric water-heaters.

Jackson Electric Stove Co., Ltd., 143, Sloane Street, S.W.1.—An illustrated catalogue containing particulars and prices of electric fires for the current season.

A. Gallenkamp & Co., Ltd., 17/29, Sun Street, E.C.—List No. 75H/231G, relating to electrically controlled apparatus and laboratory-type furnaces.

Newtons of Taunton, Ltd., 319, Regent Street, W.—A number of leaflets announcing the introduction of additional "Rotax" electric tools and giving brief particulars of these.

The Westminster Tool & Electric Co., Ltd., Westool Works, Putney Bridge Road, S.W.—The latest catalogue of electric portable tools and electric coils of all types.

Bankruptcy Proceedings

A. E. Tucker, electrical contractor, 9, Courtney Road, Waddon, Surrey.—The public examination took place recently at Croydon. Debtor said he commenced business at Waddon as an electrical contractor in February, 1930, with a capital of £40. In 1931 he incurred a loss of £60. He attributed his failure to lack of capital, underestimating contracts and heavy overhead charges. The examination was adjourned for closing.

L. S. Green & W. H. T. Green (L. & H. Green), wireless dealers, 162, Great Colmore Street, Birmingham.—Last day for receiving proofs for dividend, October 4th. Trustee, Mr. C. Hoult, 159, Great Charles Street, Birmingham, Official Receiver.

G. T. P. Yeoman (Yeoman & Greig), electrical goods agents, 4, North End Road, Golders Green, Middlesex. (Separate estate.)—Last day for receiving proofs for dividend, October 4th. Trustee, Mr. F. Vyvyan, Bankruptcy Buildings, Carey Street, W.C., Official Receiver.

J. A. Scott-Smith, electrical factor, Linden Lea, Brooklands Road, Brooklands.—Receiving order made September 18th on a creditor's petition. First meeting September 29th at the Official Receiver's offices, Byrom Street, Manchester. Public examination October 6th at the Court House, Quay Street, Manchester.

A. Senior and **H. Senior** (A. Senior & Son), electrical contractors, Back North Terrace, Darlington.—Receiving order made September 18th on debtors' own petition.

R. S. Wright, wireless dealer, 33, Broomfield Road, Coventry.—First meeting October 2nd at 9-11, High Street, Coventry. Public examination October 16th at the County Hall, Coventry.

Private Arrangements

G. T. Tibbols and **H. E. Tibbols** (trading as Tibbol's Stores), 94/96, South Street, Keighley, wireless dealers, &c.—At a recent meeting of creditors the statement of affairs showed liabilities of £2,360 and net assets of £1,456, leaving a deficiency of £904. It was pointed out that owing to the slump in the wireless trade, manufacturers reducing the price of their sets, losses incurred by the debtors through the re-possession of goods, and the fact that in many instances the hirers and people making weekly payments were not meeting their instalments when due, it became necessary in many instances for the debtors to give their suppliers bills of exchange and their financial position became strained. A resolution was passed in favour of the matter being dealt with under a deed of assignment to Mr. C. H. Baker, Leeds, with a committee of three of the creditors.

J. F. Creasey (trading as the Positive Electric Co.), 673, Romford Road, Manor Park, and at Wanstead Park and East Ham, wireless and electrical factor.—A meeting of the creditors of the above was held on September 20th at the offices of the British Traders' Association, Finsbury Pavement, E.C., when a statement of affairs was submitted which disclosed liabilities of £4,674, mainly due to the trade, and net assets of £1,675, leaving a deficiency of £2,999. In view of the fact that several creditors had commenced proceedings, it had been deemed advisable to execute a deed of assignment in order to protect the assets, and the debtor had signed a deed in favour of Mr. Osborne as trustee. The creditors confirmed the deed and appointed a committee of inspection consisting of the representatives of three of the creditors. The following are the principal creditors:—British Thomson-Houston Co., Ltd., £59; Brook Motors, Ltd., £64; E. K. Cole, Ltd., £68; Falk, Stadelmann & Co., Ltd., £1,489; General Electric Co., Ltd., £420; Johnson & Phillips, Ltd., £112; Lighting Trades, Ltd., £235; Metallic Seamless Tube Co., Ltd., £348; Sun Elecl. Co., Ltd., £72.

Company Liquidations

Cifel Products, Ltd., 134, Pentonville Road, London, N.1, wireless and electrical manufacturers.—At a meeting of creditors on September 21st at the offices of Messrs. Poppleton, Appleby and Hawkins, 4, Charterhouse Square, E.C., it was stated that the shareholders had passed a resolution nominating Mr. E. H. Hawkins as liquidator. A statement of affairs was submitted which disclosed liabilities of £3,358 and net assets of £625, leaving a deficiency of £2,733. The company was incorporated on March 21st, 1932, with a nominal capital of £2,500 to carry on business as manufacturers of paper condensers and wireless sets. The bulk of the capital provided at the commencement was utilised in the purchase of stock, plant and machinery. Latterly the company found itself in difficulties, and on July 24th last obtained an advance of £250 on which a debenture was given. The company entered into a contract at the beginning of the year to produce 675 wireless sets at a total figure of £6,600. Ultimately, however, the contract collapsed, although considerable quantities of material were purchased. It was decided to confirm the voluntary liquidation of the company with Mr. Hawkins as liquidator.

Jacobs & D'Rane, Ltd., Cheltenham, electrical engineers.—The statutory meeting of creditors was held recently in London, when Mr. Warne, the managing director, presided. It was stated that the shareholders had previously met and passed a resolution for the appointment of Mr. A. W. Mann, Cheltenham, to act as liquidator. A statement of affairs was submitted which showed liabilities of £1,348 and net assets of £156, leaving a deficiency of £1,192. The company was incorporated in 1921 with a nominal capital of £822, all of which had been allotted for cash. For the year ended September, 1931, the sales were £2,600, on which a net loss of £944 was incurred, and in the following period, to September, 1932, the sales were £1,600, and there was a further loss of £1,050, which was attributed to losses on contracts. The creditors passed a resolution confirming the appointment of Mr. Mann as liquidator.

The Sheringham & District Electricity Supply Co., Ltd., the **Southwold Electricity Supply Co., Ltd., and the Yarmouth (I.O.W.) Electricity Supply Co., Ltd.**—Winding up voluntarily. Liquidator, Mr. H. Hockley. These companies are subsidiaries of Edmundson's Electricity Corporation which is consolidating its interests and liquidating many of the smaller companies no longer necessary.

Barrons Radio Supplies, Ltd.—Meetings October 19th at 12, Birley Street, Blackpool, to receive an account of the winding-up by the liquidator, Mr. J. W. Westhead.

Eunice Radio Co., Ltd.—Particulars of claims by October 5th to the liquidator, Mr. C. Turner, 155, Norfolk Street, Sheffield.

Dissolutions of Partnership

Holland & Matthews, electricians and wireless dealers, 51, Market Street, Huddersfield.—Messrs. A. Holland and E. Matthews have dissolved partnership. Mr. Holland will attend to debts and carry on the business.

Wallace Electrical Co., decorative electrical engineers and wholesale distributors of electrical fittings, appliances, &c., 9 George Street, Manchester Square, W.—Messrs. E. J. Cripps and F. W. Greenfield have dissolved partnership. Mr. Cripps will attend to debts and carry on the business.

Electricity Supply

Lighting, Domestic, Power

Austria.—A NEW HIGH-PRESSURE STEAM STATION.—A new high-pressure steam-operated power station known as the Trebovice has recently been completed in the western area of the Ostrau-Karwin coalfield of Austria. The initial installation is of 42,000-kW capacity, but it is intended to eventually increase this to 160,000 kW. The plant comprises three Löffler boilers each capable of providing 63 tons of steam per hour at a pressure of 135 atmospheres and a temperature of 932 deg. F., and two three-stage condensing turbines direct coupled to three-phase alternators generating 50-cycle power at 6,300 V when running at 3,000 r.p.m. For transmission the power is stepped up to 110,000 V.

Aylesbury.—REVISED TARIFFS.—The Town Council has embodied in the tariff for private houses in the borough a base area charge with a "unit" charge of 1d. up to 1,000 kWh per quarter, and of 0.5d. per kWh beyond, and in the rural area charges of 1¼d. and 0.55d. respectively. For heating there is a flat rate of 0.4d. per kWh.

EXTENSIONS.—The Council has received sanction to a loan of £9,286 for the extension of the supply in the rural area, and also the consent of the Ministry of Transport to the erection of overhead lines in the rural districts of Aylesbury and Long Crendon. Owing to housing developments the cable in the Bicester Road is to be enlarged at an estimated cost of £200. The Council has approved of an expenditure of £150 upon an electrical week and exhibition.

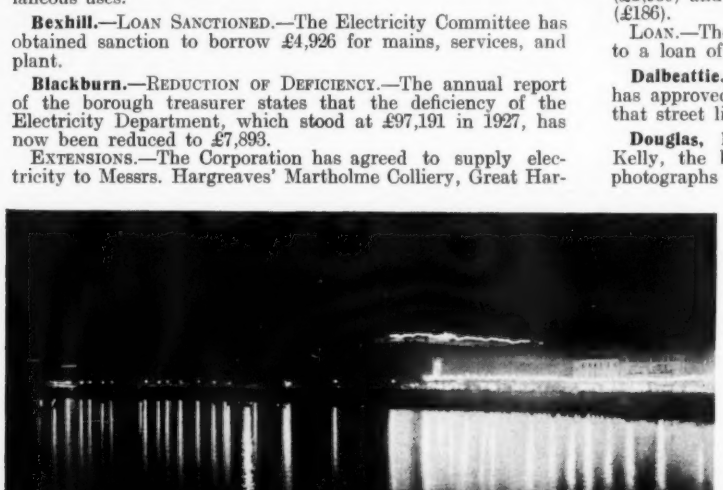
Beauly.—OVERHEAD LINES.—Notice is given that an application has been received by the Board of Trade from the Grampian Electricity Supply Co., Ltd., and the Beauly Electric Supply Co., Ltd., jointly, for permission to erect a high-voltage electric overhead cable across the foreshore and bed of the river Beauly.

Belgium.—ELECTRICITY SUPPLY PROGRESS.—According to a return lately issued, the power stations affiliated to the Union des Exploitations Electriques en Belgique comprised plant to a total capacity of about 1,355,000 kVA at the end of last year. The output of power during 1932 amounted to 1,585 million kWh. Of the production, 65.3 per cent. was disposed of in bulk, 15.4 per cent. was taken by municipal or semi-municipal concerns, 9.1 per cent. was used for traction purposes, 7.4 per cent. for private lighting and power use, 0.7 per cent. for public lighting, and 2.1 per cent. for miscellaneous uses.

Bexhill.—LOAN SANCTIONED.—The Electricity Committee has obtained sanction to borrow £4,926 for mains, services, and plant.

Blackburn.—REDUCTION OF DEFICIENCY.—The annual report of the borough treasurer states that the deficiency of the Electricity Department, which stood at £97,191 in 1927, has now been reduced to £7,893.

EXTENSIONS.—The Corporation has agreed to supply electricity to Messrs. Hargreaves' Martholme Colliery, Great Harwood; Messrs. Hoyle & Sons' Victoria Mill, Rishton; and the British Needlefelt Co., which has taken over part of India Mill, Blackburn. Copster Green will be supplied with electricity within the next few weeks.



Part of the Douglas illuminations—the Harbour end of the promenade

Bournemouth.—REDUCED CHARGES.—The Bournemouth and Poole Electricity Supply Co., Ltd., has decided to reduce the rates for supply in the parishes of Kinson and Canford Magna as follows: Lighting flat rate to be reduced from 8d. to 6d. per kWh; the two-part tariff running charge to be reduced from 1½d. per kWh to 1d. The business two-part tariff in the Bournemouth, Poole, Christchurch, and Pokesdown areas is still under consideration.

Bradford.—ELECTRICITY IN MILLS.—The number of factory owners in Bradford district who have realised the advantages of electric power in convenience and reduced running costs is now rapidly increasing. During the past few weeks extensions of the Corporation's electricity services have included conversion of the entire power plant at the Perseverance Mills, Wibsey, and the Cannon Mills, Great Horton, and last week the Electricity Committee approved a similar proposal in respect of the Herbert Street Mills of George Williamson & Co., Ltd.

Bridlington.—OFFER OF PURCHASE.—An offer of over £100,000 has been received from a London syndicate for the purchase of the electricity undertaking, and the Town Council has decided to call for a report on the proposal.

Brighton.—EXTENSIONS TO POYNING.—After a delay caused by negotiations relative to overhead lines, which were opposed by the East Sussex County Council, the Brighton Electricity Committee has decided to give way to certain objections, and to use underground lines for an extension of lines to supply the Poynings district. The additional capital cost will be £510.

MAINS EXTENSIONS.—Mains are to be extended at the cost of £2,676.

Carnforth.—EXTENSIONS.—The Urban District Council has consented to the use of additional overhead lines for a supply of electricity by the Westmorland & District Electricity Supply Co.

Cerrig-y-Druidion (Merioneth).—NEW COMPANY.—There has just been formed a private company, with a capital of £3,000 in £10 shares, for the purpose of promoting the supply of electricity for lighting and power purposes in Cerrig-y-Druidion and district. An old building has been secured at Llanfihangel G.M., where a turbine has been installed, and the supply will light the village of Llanfihangel and Cerrig-y-Druidion, with intervening farms, the supply being conveyed to the latter by overhead cables. The secretary of the company is Mr. D. J. Hughes, Maes-y-nllen, Cerrig-y-Druidion.

Chichester.—LOAN.—The City Council has applied for sanction to a loan of £14,320 for extensions to Runcton Hunston, Apuldram, Donnington, and elsewhere.

Crosby.—ELECTRICITY BEFORE CHRISTMAS.—The district manager of the Mid-Cumberland Electricity Co., Mr. R. E. Gamlen, has informed the Parish Council that a supply of electricity will be available in Crosby before Christmas, and that there will be extensions from the parish to Crosscanonby, Birkby, Crosby Villa, and Bulgill.

Croydon.—EXTENSION.—The Electricity Committee is to extend mains in the Culmington Road area (£995) and to provide an electricity supply to the Stanford Road Estate (£1,930) and a new factory at Clifford Road, South Norwood (£186).

LOAN.—The Electricity Committee is to apply for sanction to a loan of £20,000 for services.

Dalbeattie.—ELECTRIC STREET LIGHTING.—The Town Council has approved a recommendation of the Lighting Committee that street lighting in the town be by electricity throughout.

Douglas, I.o.M.—SEA-FRONT ILLUMINATIONS.—Mr. Bertram Kelly, the borough electrical engineer, has sent us some photographs which show the excellent results obtained from the scheme of illuminations carried out this year, as for the past twenty years. In all two and a half miles of promenade is lighted. We reproduce a picture of the Douglas Harbour end. An imposing sight is the Tower of Refuge (built in 1832 through the efforts of Sir William Hilary, founder of the National Lifeboat Institution), which is outlined with strip lighting.

East Ham.—LOAN SANCTIONED.—The Electricity Committee has received sanction to borrow £30,000 for house services.

EXTENSIONS.—The Electricity Committee is to extend mains at a total estimated cost of £2,403.

Falkirk.—REDUCED CHARGES.—The electricity charges are to be lowered, the rate to ordinary consumers in respect of lighting being reduced from 3d. to 2¾d. per kWh; to prepayment consumers, from 3¼d. to 3d. per kWh; large power, l.p. from £4 4s. per h.p. to £3 16s.; h.p. from £3 9s. to £3 2s. 6d.; small power, from 2¼d. to 2d. per kWh; small power, maximum demand, from 2¾d. and 1d. to 2¼d. and 1d. per kWh.

Farnham.—OVERHEAD LINES.—The Urban District Council has decided to raise no objection to the use of overhead lines by the Farnham Electricity Company in the villages of Weybourne and Boundstone.

Hamilton.—COOKERS TO BE HIRED OUT.—The Town Council has decided that in future electricity consumers will be permitted to obtain electric cookers by hire at an annual cost of between £1 and £1 10s. At present cookers are supplied only on the basis of hire-purchase over five years.

India.—STREET LIGHTING SCHEME FOR MADRAS.—The Madras Corporation proposes a new scheme of street lighting for the city at a cost of about £90,000. Electricity will be taken from the Madras Electric Supply Corporation pending the completion of the hydro-electric scheme at Mettur, which will then provide a supply.

Kettering.—LOANS SANCTIONED.—Sanction to loans for electrifying Great Oakley (£449) and Arthingworth (£1,400), and for new showrooms and offices at Market Harborough (£2,800), has been received by the Urban District Council.

London.—BATTERSEA.—The Borough Council is to carry out works as follows: Provision of electricity services to 306 premises, £2,702; replacement with armoured cable of old vulcanised bitumen mains in Bolingbroke, Louvaine, and Northcote Roads, £809; extensions of mains from St. John's Estate transformer house to the premises of Messrs. J. H. Brantom & Co., Vicarage Road, £221.

FULHAM.—The Electricity Committee proposes to seek sanction to borrow £863 for the provision and equipment of the St. James's Home sub-station, £20,000 for the rental wiring scheme, and £20,000 for meters.

STOKE NEWINGTON.—In view of the reduction of the cooking rate to ¾d. per kWh, and the anticipated demand for cookers, the Council has recommended that £10,000 be allocated from the funds of the undertaking to enable it to continue its assisted-wiring schemes.

The Electricity Committee has obtained sanction to borrow £5,000 for mains and services, and is to install free wiring in 107 cases at a cost of £443.

Two views of the effective illumination in the Ward Jackson Park, West Hartlepool

The Electricity Committee has considered the best means of bringing the advantages of an electric service within the reach of the occupiers of the new municipal flats and recommends that the Council lay new feeder and distributor cables from Edwards' Lane sub-station to the flats; that the wiring for lighting be installed by the owners; that the charge for electricity for lighting be 1½d. per lampholder per week, plus ¾d. per kWh; that the weekly charge be collected with the rent and credited to the electricity account and the "unit" charge be collected by means of slot meters; where cookers and washboilers are required, that the wiring and apparatus be installed at the cost of the electricity undertaking; that the charges for electric cookers and washboilers be 1d. per kWh with a weekly rental of 7d. for cookers and 2½d. for washboilers, collected also with the weekly rent; since cookers are likely to be required ultimately throughout the flats, that cooker mains be installed for all flats during the erection of the buildings.

ST. PANCRAS.—The Electricity Committee has received permission to borrow £4,660 for mains and services and £3,200 for changing and altering consumers' apparatus, and to change the system of supply from d.c. to a.c. in the south-eastern area of the borough.

The Electricity Committee recommends that two stand-by transformers be provided at a cost of £360, and that extensions costing £2,509 be carried out.

The Finance Committee recommends the allocation of £13,940 from the profits of the electricity undertaking to the relief of the rates.

Lowestoft.—LOAN.—The Electricity Committee has obtained permission to borrow £1,098 for mains.

Luton.—LOANS.—The Town Council has applied for sanction to loans of £25,000 for mains and services, £5,000 for house service meters, and £2,000 for transformers. At the instruction of the Central Electricity Board, a cooling tower is to be erected at an estimated cost of £12,273.

Manchester.—EXTENSIONS AT WORKS.—The Electricity Committee is considering extensions at the Stuart Street electricity works, involving an expenditure of £250,000. The developments will be followed by other alterations which will increase the output of the works. The capacity of Stuart Street at the end of the last financial year was 106,750 kW.

Mossblown (Ayrshire).—ELECTRIFICATION SCHEME.—Operations are proceeding with a view to a general scheme of electrification for the home. The houses in the village are being wired and poles erected throughout the district. Bairds and Dalmellington Colliery Co. are responsible for the scheme.

Northamptonshire.—REDUCED POWER CHARGES.—The Wellingborough Electric Supply Co., Ltd., and the Rushden and District Electric Supply Co., Ltd., have announced a reduction in the charges for a.c. supply as from the Michaelmas meter readings. The charges will be: First 500 kWh per quarter, 2.25d. per kWh; next 50,000, 1.2d.; remainder, 1.1d.

Northern Ireland.—BELFAST.—A report outlining three schemes for the supply of electricity to north and north-west Belfast was submitted to the Belfast Corporation Electricity Committee. One scheme involves carrying electricity across the Harbour channel from the electricity works by means of cables, while another scheme proposes the use of steel overhead towers. The third scheme would involve joint working with the Northern Electricity Board, and would probably lead eventually to supplying current from Belfast station to all parts of Northern Ireland. The Harbour Commissioners have been approached in connection with the latter scheme.

Preston.—RIBBLE STATION TO BE TAKEN OVER.—The Electricity Committee has been notified that the Central Electricity Board will take over the Ribble power station on January 1st, 1934, or shortly before. Although the Board undertakes to take over all obligations of the Corporation, it does not agree to the carrying out of any extension to the station at present.

CORPORATION ACQUIRES PREESALL UNDERTAKING.—The Corporation has concluded negotiations with the Preesall Council for the acquisition of its electricity undertaking on the following terms: (1) The Corporation to pay £15,000 for capital assets; (2) electricity to be supplied by Preston in the Preesall area at not more than 20 per cent. above the Preston prices. The terms proposed are subject to the Corporation obtaining a Special Order authorising it to supply and to take over of the Preesall Order.

MAINS EXTENSIONS.—The Electricity Committee has decided to extend the main to Hambleton and Stalmine at a cost of £8,943, for which a loan is to be obtained.

Salisbury.—OVERHEAD LINE.—A Ministry of Transport inquiry was held recently relative to the application of the Wessex Electricity Co. for permission to erect an overhead line from Salisbury to Elderbury, *via* Coombe Bissett. The line will be about ten miles long, and will supply eight villages *en route*. The company has arranged wayleaves and can commence the work immediately. The Mayor said that he hoped to adhere to the principle of keeping overhead wires out of the city. Mr. G. E. Crowson, for the Wessex Electricity Co., has estimated the cost of laying the line underground in Salisbury at £150 or £200 extra.

Shipston-on-Stour.—OVERHEAD LINES.—The Rural District Council has decided to offer no objection to the use of overhead lines at Halford, Sutton-under-Brailes, and Stourton by the Shropshire, Worcestershire & Staffs Electric Power Co.

Stirling.—ALLOCATION OF SURPLUS.—The surplus on the Corporation electricity undertaking for the past year, amounting to £1,374, has been allocated as follows: £600 to the relief of rates and £774 to be carried forward for reduction of the price of electricity. Lighting is reduced from 4d. to 3½d. per kWh and the public lighting rate remains at the present figure of ½d. per kWh.

West Hartlepool.—JUBILEE ILLUMINATIONS.—Mr. S. Tillotson, the borough electrical engineer, has sent us a number of photographs (two of which are reproduced herewith) of the illuminations at the Ward Jackson Park on the occasion of its jubilee. Many excellent effects were obtained, and altogether 2,000 coloured lamps, involving the use of three miles of cable, were installed.

Wigton (Cumberland).—SUPPLY INAUGURATED.—The supply to the town was switched on by the chairman of the Council, Mr. G. Johnston, on September 16th. The Supply is being given by the Mid-Cumberland Electricity Co., Ltd.

Wolverhampton.—LOANS.—The Electricity Committee is to apply for sanction to loans of £10,000 for transformers and switchgear and £25,000 for mains.

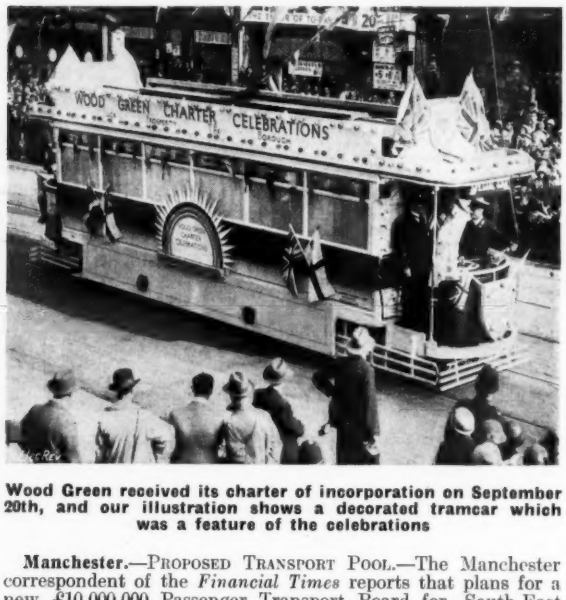
Mains are to be extended to the Marston Road Estate at a cost of £1,486, and elsewhere at a cost of £2,100.

Traction

Brighton.—THE TRAFFIC "POOL."—The Minister of Transport has suggested that the scheme of "pooling" the municipally-owned trams and private omnibuses be dropped owing to the ratepayers rejecting the proposal at a recent poll, but the Council feels that as only a small proportion of the electorate voted, the remainder are content to leave the matter in its hands, and is therefore to ask the Minister to receive a deputation with a view to changing his decision.

London.—A NEW STATION.—The British Museum station has been closed and its traffic will be taken over by the new Holborn (Kingsway) station. The new station will facilitate and accelerate changing from the C.L.R. to the Piccadilly line. The new platforms are nearer to the surface than those of the Piccadilly line. On one of them is a new type of signal cabin with power-controlled levers, and there are also relay and battery rooms, emergency tunnel telephones, and the automatic train stops which are now in general use.

ST. PANCRAS.—The Corporation Highways Committee is to provide traffic signals in Euston Road (£3,300), Cleveland Street (£700), and Woburn Place (£575).



Wood Green received its charter of incorporation on September 20th, and our illustration shows a decorated tramcar which was a feature of the celebrations

Manchester.—PROPOSED TRANSPORT POOL.—The Manchester correspondent of the *Financial Times* reports that plans for a new £10,000,000 Passenger Transport Board for South-East Lancashire and North Cheshire on the lines of London Transport have been considered by the Manchester Transport Committee. The scheme provides for the amalgamation of nine transport authorities—Ashton-under-Lyne, Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Stockport and the Stalybridge, Hyde, Mossley and Dukinfield Joint Board. In a report prepared by the general managers of the undertakings concerned it is pointed out that great economies could be effected by eliminating much of the duplication which is created by separate undertakings. Wages could be standardised and rolling stock and fares could be made more uniform throughout the area. Various methods of transferring the various undertakings to the Board are examined in the report, but it is suggested that a valuation basis would be preferable. The Board would be self-supporting and no rate security should be offered.

Morocco.—ELECTRIC TRACTION PROGRESS.—A return lately issued shows that about 64 per cent. of the passenger and goods traffic on the railways in Morocco is now being hauled by electric locomotives. So far about 195 miles of the Moroccan railways have been electrified, a total which will shortly be brought up to about 312 miles by the completion of the electrification of the line which connects Sidi-el-Aidi and Marrakech.

Newcastle-on-Tyne.—RAIL-BUS SERVICE.—The new Diesel electric "railbus" built by Sir W. G. Armstrong Whitworth & Co., Ltd., for the L.N.E.R. has begun extended trials under normal working conditions on branch lines round Newcastle. During the next six months it will serve western lines from Newcastle to North Wylam, Prudhoe, Rowlands Gill, and Leamside area.

Southend-on-Sea.—TROLLEY-BUS SYSTEM.—The Town Council has decided to apply to the Ministry of Transport for an Order authorising it to extend the trolley-car system from the Kursaal to the Cambridge Hotel at Shoeburyness. The estimated cost, including cables and overhead equipment and fifteen trolley vehicles, is £38,727.

Sunderland.—TRAMWAY SERVICE EXTENSION.—The Transport Committee is to provide a tramway service through the Villette Road, Ryhope Road and Burdon Road areas.

Wolverhampton.—NEW TROLLEY-BUSES.—The Transport Committee has decided to replace old vehicles and purchase twenty-four new trolley buses at an estimated cost of £45,000, and to extend the Low Hill trolley vehicle route at a cost of £500.

Communications

Australia.—BROADCASTING PROGRESS.—Mr. H. P. Brown, director of Australian Posts and Telegraphs, said at the annual meeting of the Institution of Radio Engineers, in Sydney, that at the present rate of progress they could reasonably expect 650,000 listeners by 1937 and 700,000 in 1940. Mr. Brown also said that the question of long-wave stations was still in abeyance. The Radio Research Board was going into the matter thoroughly. There were facilities for not more than six long-wave stations in Australia, but it would probably be inadvisable to use more than four.

BASS STRAIT TELEPHONE.—An indication that the suggested telephone facilities across the Bass Strait, connecting Tasmania with the mainland, will be carried out was given by Mr. Parkhill, the Australian Postmaster-General, to a deputation which interviewed him at Hobart. Mr. Parkhill said that two systems had been examined, one by cable, which would cost £188,000, and the other by radio-telephone, which would cost £55,630, but the annual charges would be about the same. The department favoured a cable system as a radio service would be inelastic, would not ensure secrecy, would not provide even for the immediate needs of the State, and would be subject to fading and atmospherics. The matter would be considered by the Cabinet in its review of the estimates for the current financial year.

Belfast.—NEW TRANSMITTING STATION.—The B.B.C.'s scheme whereby greater receptive service will be provided throughout Northern Ireland by a new transmitting station designed to furnish adequate receptive facilities for eighty per cent. of the population will extend only to the technical side of the service and the form of the programme now being broadcast will not undergo any radical change.

China.—NEW RADIO TOWERS.—Eight additional aerial towers for the International radio station at Chenju were to be completed this month, says the *Chinese Economic Bulletin*. Three are situated at Chenju and five at Liuho. These aerial masts have a height of 160 feet and will be employed for the extension of activities of the station which is now communicating directly with America, Soviet Russia and Europe, and will shortly inaugurate direct service with England.

Devon.—NEW TELEPHONE CABLES.—Work is now in progress in connection with the creation of a new telephone trunk system for North Devon. Underground cables are being laid between Exeter and Barnstaple, by way of Crediton and Okehampton. The cable, which is armoured, is being laid directly in the ground. In addition, a new overhead route is being constructed between Okehampton and Barnstaple, which will give the first direct link between the Barnstaple area (which includes Ilfracombe and Barnstaple) and the group of moorland cottages of which Okehampton is the centre.

Dutch East Indies.—NEW RADIO-TELEPHONE SERVICES.—A radio-telephone connection between the island of Java and the port of Makassar in Celebes was recently inaugurated by the Dutch East Indian Postal Telephone and Telegraph Service. An overland long-distance telephone service has also been completed between Palembang and Benkoelen, two important towns in South Sumatra.

Great Britain.—RADIO RELAY SERVICES.—The Incorporated Municipal Electrical Association is advising municipalities to consult their electricity committees and electrical engineers before sanctioning the erection of overhead lines for radio relay purposes.

Rediffusion, Ltd., has informed the St. Albans City Council that the company does not propose to proceed with the installation of a service in the city, and an agreement entered into has been cancelled by the Corporation.

The Petersfield Urban Council has entered into an agreement with a firm for the installation of a service.

At Kilmarnock (Ayrshire) Dean of Guild Court, on September 21st, the Scottish Relay Service (Kilmarnock), Ltd., was granted permission to erect a relay receiving station in Glasgow Road at a cost of £200.

India.—PROPOSED CABLE TO CEYLON.—It is understood that the Ceylon Government has approved the proposal to lay a new cable between Talaimannar, the terminus of the Government Railway, and Dhanushkodi, in Southern India. The new cable, which would replace an old one, would carry both telephone and telegraph messages, and would cost about £35,000, the Governments of India and Ceylon each paying half. Inquiries are being made to ascertain the probable volume of telephone traffic between Colombo and India and between Colombo and London, should this cable be installed.

PROFIT ON BROADCASTING.—For the first time a small profit on broadcasting in India has been made this year. Mr. R. N. Howes, the station director at Calcutta, in making this announcement, said it would mean increased funds and better programmes. The short-wave transmissions are received regularly and satisfactory in all parts of India as well as in overseas countries.

South Africa.—WIRELESS STATIONS FOR AIRCRAFT.—It is stated that the Union Government is considering the establishment of wireless stations for communication with aircraft at Durban, Port Elizabeth, and East London.

Yorkshire.—POLICE RADIO.—The West Riding police have received sanction to the erection at Woolley, near Wakefield, of a wireless transmitting station for maintaining communication with mobile police cars.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Australia.—MELBOURNE.—Post and Telegraph Department. October 31st. Condensers for use in radio transmitters. (A.Y. 11963.)*
November 21st. Telephone terminal strips. (A.Y. 11996.)*
November 14th. Ringing dynamotors. (A.Y. 11984.)* Telephone ringers. (A.Y. 11986.)* Submarine telephone cable. (A.Y. 11973.)*
October 30th. State Electricity Commission of Victoria. 6,600-V current-limiting reactors. (A.Y. 11971.)*

Bolton.—October 18th. Electricity Department. Electrical installation in 360 houses, &c. (See this issue.)

Dumbarton.—October 6th. County Council. Electrically operated swing bridge over the Forth and Clyde Canal at Erskine Ferry Road, Old Kilpatrick. Messrs. Crouch & Hogg, chartered civil engineers, 17, Lynedoch Street, Glasgow (deposit £5 5s.).

Egypt.—CAIRO.—October 5th. Ministry of the Interior. Main switchboard, four distribution panels, earthing materials, instruments and reactance coils. (A.Y. 11957.)*
November 14th. Pumps, electric motors, boilers, &c. (G.Y. 12912.)*

ALEXANDRIA.—October 25th. Ports and Lighthouses Administration. Electric cables, switchgear, transformers, electrically driven hauling winches and motors for the port of Alexandria. Chief inspecting engineer, Egyptian Government, 41, Tothill Street, London, S.W.1. (Specifications, &c., 12s., not returnable.)

GIZA.—October 5th. Ministry of Education. Cables, switchboards and other electrical apparatus. (A.Y. 11957.)*

Glasgow.—October 5th. Corporation. Electrical work at Trades School, Shamrock Street. Specifications from Education Offices, 129, Bath Street; offers to Town Clerk.

Grays Thurrock.—October 11th. Electricity Department. Transformer kiosks, h.p. switchgear, 3,300-V and l.p. cables, &c. (September 22nd.)

India.—NEW DELHI.—December 4th. Indian Stores Department. 220/230-V, single-phase, 50-cycle ceiling fans. (A.Y. 11959.)*
December 11th. D.c. ceiling fans. (A.Y. 11965.)*
January 8th. A.c. and d.c. table fans. (A.Y. 11967.)*
October 25th. A.c. and d.c. meters. (A.Y. 11968.)*

London.—SOUTHWARK.—November 1st. Borough Council. Electric cables for twelve months ending November 30th, 1934. (See this issue.)

New Zealand.—WELLINGTON.—October 26th. Post and Telegraph Department. 12-V switchboard lamps (A.Y. 11955)* and telephone gongs and attachment nuts. (A.Y. 11956.)*
October 31st. Metal-cased condensers. (A.Y. 11954.)*

South Africa.—JOHANNESBURG.—October 28th. City Council. Five sets of electrically operated traffic signals. (A.Y. 1191.)*
October 14th. Six 3-phase, metal-clad h.p. switchgear units. (A.Y. 11981.)* Metal-clad l.p., a.c. switchgear. (A.Y. 11980.)*
October 23th. Two single-phase 1,620-kVA transformers. (A.Y. 11982.)*

CAPE TOWN.—November 29th. Electricity Department. Fifty automatic street-lighting controllers. (A.Y. 11994.)*

Swansea.—October 9th. Electricity Department. Coal-handling plant for the new Tir John power station. (September 8th.)

Wick.—September 30th. Town Council. Electric lighting work for housing scheme. Burgh surveyor (deposit £1 1s.).

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Bedford.—Electricity Committee. Recommended. Transformers for twelve months.—British Electric Transformer Co., Ltd. E.h.p. switchgear (£882).—British Thomson-Houston Co., Ltd. H.p. and l.p. switchgear (£754).—Drake & Gorham, Ltd.

Croydon.—Electricity Committee. Accepted. Two 750-kVA transformers (£678).—British Electric Transformer Co., Ltd.

East Ham.—Electricity Committee. Accepted. Feeder pillar, transformer and balancer (£317).—Ferranti, Ltd. Induction regulator equipment (£189).—English Electric Co., Ltd.

Falkirk.—Corporation. Accepted. Electrical work at Corporation housing schemes (£1,071).—A. K. Stables.

Greenock.—Corporation. Accepted. Electrical work at housing scheme.—J. Edward.

Grimsby.—Electricity Committee. Recommended. Turbo feed pump (£554).—J. P. Hall & Sons.

Kettering.—Electricity Department. Accepted. 2,000-kVA transformer (£495).—Yorkshire Electric Transformer Co., Ltd.

Kirkcaldy.—Corporation. Accepted. Electrical work for ninety-two houses (£326).—Dick-Cleland, Bennet & Co.

London.—FULHAM.—Electricity Committee. Recommended. Switchgear for turbo-alternators, with reactor equipment and twelve feeder circuits (£290,718).—Metropolitan-Vickers Electrical Co., Ltd. Other tenders received for this work were: General Electric Co., Ltd., £290,718; Ferguson, Pailin, Ltd., £290,768; British Thomson-Houston Co., Ltd., £293,754; English Electric Co., Ltd., £296,700; and A. Reyrolle & Co., Ltd., £304,489.
HAMMERSMITH.—Electricity Committee. Recommended. Electric wiring installation in 112 flats on L.C.C. Wormholt Estate (£326).—G. Goodchild.

BATTERSEA.—Electricity Committee. Accepted. L.p. switchgear (£70).—Switchgear & Cowans, Ltd.
ST. PANCRAS.—Contracts and Stores Committee. Recommended. L.p. cable (£3,283).—Metropolitan Electric Cable and Construction Co., Ltd. H.p. cable (£207).—Standard Telephones and Cables, Ltd.

Lowestoft.—Electricity Committee. Accepted. Transformers.—Crompton Parkinson, Ltd. (£131); English Electric Co., Ltd. (£251).

Middlesbrough.—Town Council. Accepted. 2,200 yds. of l.p. cable.—Macintosh Cable Co., Ltd.

Pershore.—Rural District Council. Accepted. Wiring twenty houses at Pinvin (£63).—Abell & Smith.

Shipley.—Electricity Committee. Accepted. Two transformers (£125).—Foster Engineering Co., Ltd. Automatic voltage regulating equipment (£206).—English Electric Co., Ltd.

Smethwick.—Gas Committee. Accepted. Electric cables (£160).—Callender's Cable & Construction Co., Ltd.

The Diesel-electric tug, *Acklam Cross* **(See page 433)**

Southend-on-Sea.—Town Council. Accepted. Adaptation of consumers' apparatus: Queen's Hotel premises (£285).—G. A. Weston; Palace Hotel area (£264).—F. P. Richard & Co.; Queen's Hotel area (£237).—W. Jay.

Sunderland.—Town Council. Accepted. Electric capstan with a Sunderland Forge motor.—Cowans Sheldon, Ltd.

Wolverhampton.—Electricity Committee. Accepted. Voltage regulator (£167).—Ferranti, Ltd.
Water Committee. Accepted. Motor for Tattenhall waterworks (£151).—English Electric Co., Ltd.

Forthcoming Events

Electrical Power Engineers' Association *(Southern Division).*—Saturday, September 30th. Holborn Restaurant, W.C. 5.30 for 6 p.m. Annual dinner.

Institute of Marine Engineers.—Tuesday, October 3rd. Institute, London. 6 p.m. Presidential address by Sir S. George Higgins.

Institution of Engineers and Shipbuilders in Scotland.—Tuesday, October 3rd. Presidential address by Prof. J. D. Cormack.

Edinburgh Electrical Society.—Wednesday, October 4th. Philosophical Institution, Edinburgh. 8 p.m. Presidential address by Mr. J. M. Couch.

The Gainsborough Film Studios

ABOUT 650 kW of lamps is used to illuminate some of the sets of Gainsborough Pictures (1928), Ltd. Electricity is supplied at 6 kV, three-phase, 50 cycles by Islington Corporation through a separate cable from its power station. It is transformed in the studio sub-station to 220-V a.c. by British Westinghouse transformers and converted to d.c. by motor generators supplied by the General Electric Co., Ltd., which also provided the switchgear. Messrs. Duncan Watson & Co., Ltd., were the installation contractors for the h.v. chamber and motor-generator sub-station.

D.c. is used on account of the large number of arc lamps employed. It is distributed throughout the studios by a 240/120-V three-wire system through four sets of controls. There are eight main distribution points in the form of wall-boxes, from which flexible cables are taken to "spider-boxes" of the Gainsborough Co.'s own design; on a big set as many as forty-two six-way spider boxes may be used in addition to the arcs, which are fed independently of these boxes. The total number of units of light, mainly of B.T.-H., G.E.C., and Kandem Co.'s manufacture, is nearly 200, including 160-A arc lamps and 5-kW spotlights and floodlights. Mr. S. Sargent is chief electrician of the Gainsborough Co. The sub-station is illustrated on page 415 and pictures of the lighting equipment are reproduced on page 417.

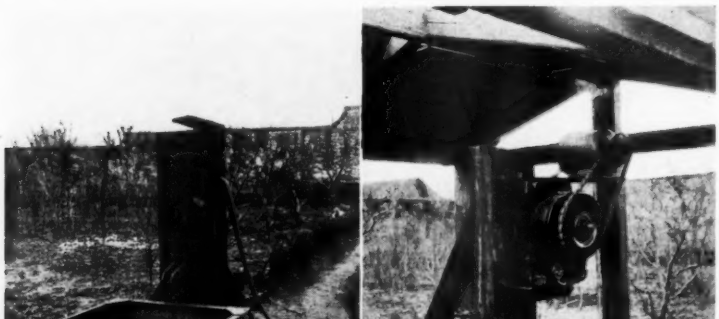
Notes

The I.E.E. Programme

The Institution of Electrical Engineers opens its London session on October 26th, when Mr. P. V. Hunter will deliver his presidential address. During the first half of the 1933-34 session the following papers will be read:—November 9th: "The Lower Voltage Sections of the British Grid System," by Mr. C. W. Marshall; November 23rd: "Recent Investigations on Telephone Interference" (Electrical Research Association Report), by Messrs. W. G. Radley and S. Whitehead; December 7th: "The Application of Automatic Voltage and Switch Control to Electrical Distribution Systems," by Messrs. W. Kidd and J. L. Carr; December 21st: "Electromagnetic Phenomena in High Voltage Testing Equipment," by Mr. B. L. Goodlet; January 4th: "The Influence of Certain Transmission-Line Associated Apparatus on Travelling Waves," by Mr. J. L. Miller; January 18th: "Some Aspects of the Electrical Transmission of Power by means of Super-Tension Direct Current," by Mr. H. Rissik.

Electricity Shows the Way

A paper entitled "What is Wrong with the Gas Industry?" was read by Mr. D. A. Pratt (York) at a meeting of the Wales and Monmouthshire Association of Gas Engineers and Managers last week. In the course of this the author said that the industry's electrical competitors possessed two great virtues—



A well pump before and after electrification

enthusiasm and determination. Being shackled at present by out-of-date legislation, having the resources of the Government against it, and boycotted by a number of municipalities owning electric power stations, the gas industry had been fighting an uphill battle. The time had arrived to "show the fighting spirit and to contest every inch of the way for business, believing in the superiority of our product."

It was embarrassing to be told "Why, even your own directors use electricity!" He had never heard of an electrical chairman of directors or committee using gas in his own home or business. The public could not be blamed if they formed the impression that it was fashionable to have electricity. Politicians of all parties advocated it; the Government gave it much publicity and actively helped it along; and the taxpayer was also brought in to assist.

Their competitors had scored over them when they formed an Electrical Association for Women. Branches were being formed in various parts of the country with the object of increasing the sale of electricity and electrical appliances. The electrical people had often followed their lead. Could they not, without loss of dignity, follow with a Women's Gas Association?

The Reorganisation of Industry

The first of the 1933-34 season's monthly luncheons of the Batti-Wallahs' Society took place at the Hotel Metropole on Wednesday under the chairmanship of Mr. Wm. Lang, the president. Mr. A. P. Young, Rugby Works manager of the B.T.-H Co., was the principal guest, and in his address pointed out that the present state of affairs was largely the result of the too sudden creation of an age of plenty, for which the engineer was primarily responsible. Individual productivity had been increased enormously, and transportation and communication had been wonderfully improved. Was it too much to hope for a common language and a better understanding between all nations with a common aim of productivity for "service"?

It had become necessary to devise some better system of distribution for the common good of all. To plan and control industry for the co-ordination of human effort seemed to be the aim of most countries at the moment. The B.B.C., C.E.B., Port of London Authority, London Passenger Transport Board, and the Milk Marketing Board were examples of co-ordinated public services. Any such scheme must preserve individuality while promoting co-ordination. Elsewhere he had outlined in some detail a Planning Control Board elected by and for the twelve basic industries, a sort of industrial Parliament with its Cabinet, at the head of which might be a Minister of Industry. The future structure of industry on such lines as these was probably nearer than most people supposed.

Mr. A. W. Blake (Willesden) proposed a vote of thanks to Mr. Young, and the secretary announced that the next luncheon would be on October 26th, at which Sir H. Mensforth would be the chief guest.

Appointment Vacant

Chief meter inspector for the Kingston-on-Thames Electricity Department.

Educational

The prospectus of the University courses for the 1933-34 session at the Municipal College of Technology, Manchester, is now available, and copies can be obtained on application to the principal.

The London University Guide & University Correspondence College Calendar is also available, and contains full details of the courses, examinations, syllabuses and textbooks, &c.

An Electrified Pump

The elimination of pumping by human labour is one of the great boons brought by electricity to country districts, and the conversion of old-fashioned manually operated pumps to electric driving is often feasible.

The accompanying pictures illustrate a successful conversion carried out about a mile from Wrexham. The stables of what was once a country house are now used by a wholesale and retail butcher for the making of pork pies, sausages, &c. The business required a refrigerator and a considerable water supply; it was decided, instead of purchasing water from the town, to use a well in the garden efficiently by driving the pump by electricity which comes overhead for about a quarter of a mile from the public mains.

The water supply for the refrigerator is controlled automatically, according to the temperature of the atmosphere, from a tank, and in turn the water supply to the tank from the pump is controlled by a contactor starter and float switch. The pump, when operated by hand at the normal rate, had a capacity of about six gal. per min., the surface of the water being about 36 ft. below ground level. It was impossible to mount the pump down in the well, so it was decided to make use of the existing pump barrel, which is fixed at the water level. A pumping equipment manufactured by Messrs. Abell & Smith and driven by a ½-h.p. B.T.-H. motor was then installed. It was found, however, that the motor would not always start owing to the weight of the pump connecting rod.

A 1-h.p. motor was therefore installed, and the converted pump is now operating satisfactorily. The motor is a B.T.-H. 3-phase, 400-V, 50-cycle machine running at 1,420 r.p.m., and is controlled by a contactor starter operated by a float switch.

The Battersea Station

Two errors occurred in the inscription to the set of pictures of the new Battersea power station on page 377 of our last issue. No. 5 should have been described as the roof of the boiler house and gantry over the main flue, while No. 8 showed the *forced* not induced draught plant.

E.A.W. Examinations

The first examinations for the E.A.W. certificate in electrical housecraft were held at the Grid Houses at Manchester, Leeds, Bristol, and London, by courtesy of the C.E.B., on September 7th. Certificates have been awarded to the nineteen successful candidates, five of whom passed with distinction, and as soon as they are able to satisfy the Training and Diploma Committee that they have had two years' experience of a responsible nature in the electrical industry, they will be awarded the E.A.W. Grade I Demonstrator's Diploma.

Bradford Women's Electrical Class

"Electricity in the Home" is a practical class arranged for the winter session of the Belle Vue Higher Domestic Institute for girls and adults, Bradford. The class is held on Thursday evenings, commencing September 28th, at the Bradford Electricity Department headquarters.

Electrical Industries Ball

The second annual ball of the Electrical Industries Benevolent Association is to be held on November 23rd at Grosvenor House, Park Lane.

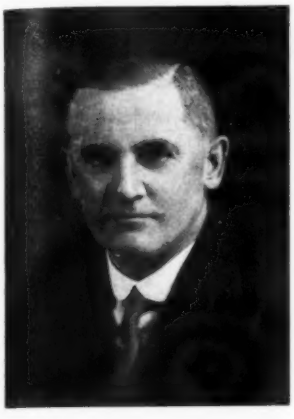
Makers' Names Wanted

CLEARSITE MANUFACTURING CO., of Chicago (British agents).
PENETROL transformer insulating compound.
Electric poker for igniting coal fires.
ROTAX cake mixer.
CELL-NEON signs.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Mr. E. A. Mills, the borough electrical engineer of Halifax, who was responsible for the organisation of the electrical exhibition referred to on p. 440, has been with the Electricity Department just over two years, having previously been with the Leicester Electricity Department. At the opening of the exhibition on September 20th he received the congratulations of Sir John Brooke, who said he was not only a first-rate engineer, but a very sound commercial manager. At the Electricity Commission they looked upon Mr. Mills as one of their best friends.



[*Lafayette*
Mr. E. A. Mills

Mr. S. A. Harrowell, after ten years' association with C.C.A. (Central Cables & Accessories, Ltd.), is commencing business on his own account at 3, Fitzroy Street, W.1, as manufacturers' agent on October 2nd.

Mr. H. Belbin, who has been appointed manager of the new branch of Electrical Conduits, Ltd., has had wide electrical experience. After the war he held positions in Germany and other Continental countries, and before joining his present company represented Messrs. Baxter & Caunter, Ltd.

Mr. L. G. Hawkins has resigned from the Board of Pye Radio, Ltd., and **Mr. C. O. Stanley** has been appointed an additional director.

Mr. and Mrs. Philip Irwin, who were married recently, have been presented by the staff of the Birkenhead Corporation Electricity Department with an electric grandmother clock. Mrs. Irwin was formerly cookery demonstrator in the showrooms, and Mr. Irwin has held the position of time-keeper and wages clerk for several years. The presentation was made by Mr. F. E. Spencer, the borough electrical engineer.

Dr. A. H. Railing, a director of the General Electric Co., Ltd., and a number of its associated companies, was married on September 21st to Miss C. C. Nauheim at Marylebone Register Office. Miss Nauheim is a prominent architect and

Dr. A. H. Railing leaving the Marylebone Register Office after his marriage to Miss C. C. Nauheim

was for a number of years associated with Sir Edwin Lutyens, the designer of the Cenotaph.

Mr. C. S. Taylor, consulting engineer to the Shanghai Power Co., 53, Parliament Street, Westminster, informs us that from October 1st his address will be 68, Fenchurch Street, E.C.3 (telephone: Royal 6955).

Among the premium awards made by the Council of the Institute of Transport in respect of the session 1932-33 is the Railway Engineering Medal, which has been granted to **Mr. F. Lydall,** M.I.E.E., of Messrs. Merz & Partners, consulting engineers for his paper dealing with "British Main Line Electrification."

Mr. L. Clarke, A.M.I.Mech.E., for many years chief draughtsman of the British Electric Transformer Co., Ltd., informs us that he is no longer with that company.

Mr. T. E. Daniel, whose appointment as borough electrical engineer and manager of the Ashton-under-Lyne electricity works was recorded in our last issue (p. 403), was educated at Wallasey Grammar School and Liverpool University. He served his apprenticeship with Messrs. Fawcett, Preston & Co., Ltd., Liverpool, and had held positions with the North Metropolitan Electric Power Supply Co., and Battersea Borough Council, before going to Ashton some eighteen months ago as deputy electrical engineer. He is an Associate member of the Institutions of Electrical and Mechanical Engineers, and holds the degree of Master of Engineering.

Elliott & Fry
Mr. T. E. Daniel

Messrs. W. E. Young, A. L. Mellor, and W. Nithsdale, who have held responsible positions with Messrs. Yarrow & Co., Ltd., for many years have been appointed to the board of the company.

To the regret of the directors of the Mid-Southern Utility Co., of Aldershot, **Mr. R. H. Studholme,** M.A., has, for urgent domestic reasons, resigned his position as solicitor to the company. He has been succeeded by **Mr. John F. Jackson,** of Stafford.

Major T. Rich was elected president of the Overhead Lines Association for the 1933-34 session at the annual meeting held on September 20th. **Mr. A. E. Boyd,** who has succeeded **Mr. G. W. Molle** as hon. secretary, was in the chair, and before the business of the meeting was proceeded with Mr. A. Lennox Stanton, the retiring president, presented Mr. Molle with a silver cigarette box, suitably inscribed, as a mark of the appreciation of the members of his work for the Association during his three years as hon. secretary.

Major G. B. J. Athoe, F.R.S.A., F.I.A.A., F.I.S.A., the author of the article on "A Scheme to Floodlight London," on page 413 of this issue, is secretary of the Incorporated Association of Architects and Surveyors

Mr. G. S. Samways, manager of the export department of Crompton, Parkinson, Ltd., was married at St. Mary's Church, Stafford, on September 12th, to Miss Barbara Alderton, and he has been presented by the directors with a cheque and by the staff with a collection of silver cutlery.

Mr. G. W. Southey, who has acted for thirty-six years as the Board of Trade electrical inspector under the Cardiff Corporation Electricity Committee, has sent in his resignation and, on the advice of Mr. C. G. Morley New, the borough electrical engineer, the Committee has decided not to make a new appointment.

Obituary

Dr. H. Beckmann.—The death recently occurred in Berlin, at the age of sixty years, of Professor Dr. Hermann Beckmann, who was associated for nearly thirty years with the Berlin-Hagen Akkumulatorenfabrik Gesellschaft. He was a leading German authority on accumulator manufacture.

Mr. G. M. Addison.—The death occurred on September 21st of Mr. George M. Addison, distribution superintendent in the Alloa district of the Scottish Central Electric Power Co. Mr. Addison went to Alloa from Dundee over twelve years ago as charge hand in the Electricity Department of Alloa Town Council, the undertaking being later taken over by the Scottish Central Electric Power Co.

Mr. J. Masterton.—The death has occurred in Edinburgh of Mr. John Masterton, O.B.E., H.M. Divisional Inspector of Mines. Mr. Masterton was vice-president of the Mining Institute of Scotland.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Electric Refrigerator Sales and Service, Ltd.—Private company. Registered September 21st. Capital, £300 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in electrical refrigerating machinery and appliances, wireless apparatus, &c. The subscribers are: R. J. Simpson, 10, Holmwood Grove, Mill Hill, N.W.7; and W. J. Mealing, 36, Foscote Road, Hendon, N.W.4. The first directors are W. A. A. Searle and R. J. Simpson. Secretary: W. J. Mealing.

Lewtas's, Ltd.—Private company. Registered September 14th. Capital, £100 in £1 shares. Objects: To acquire the business of manufacturers, merchants and factors of incubators, lamps and gas, incandescent and electric lighting and hardware goods, carried on by J. Lewtas, Ltd. (in voluntary liquidation), at Viaduct Road, Altrincham, Ches., and to adopt an agreement with R. Sowood, receiver on behalf of a debenture holder of the said company. The directors are: Miss Doris V. Lee, Dilkusha, Nant-y-Glyn Road, Colwyn Bay; Mrs. Winifred V. Lewtas, Bootbank, Allostock, near Knutsford; and Herbert V. Lee, Hazelhurst, Church Road, Rhos-on-Sea, Colwyn Bay. Solicitor: T. Arthur Hughes, Colwyn Bay.

William Harvie & Co., Ltd.—Private company. Registered September 14th. Capital, £100 in £1 shares. Objects: To acquire all or any part of the business and undertaking of William Harvie & Co., Ltd. (in voluntary liquidation), incorporated in 1892, and to carry on the business of lamp makers, brassfounders, electrical engineers and manufacturers of electrical appliances, &c. The first directors are: William T. George, 19, Stonerwood Avenue, Hall Green, Birmingham, and Leslie T. George, 32, Smirrells Road, Hall Green, Birmingham. Registered office: 121, Bishop Street, Birmingham.

Radiovox Wireless Services, Ltd.—Private company. Registered September 20th. Capital, £1,000 in £1 shares. Objects: To carry on the business of radio and general engineers, manufacturers of and dealers in radio receiving, sound reproduction and television sets, &c. The permanent directors are: Arthur McKay, "Briar Dene," Thornhills Lane, Clifton, Brighouse, Yorks (chairman); Richard W. Lowden, 8, Woodsley Terrace, Leeds (managing director). Registered office: 34, Basinghall Street, Leeds.

J. & W. Thomas, Ltd.—Private company. Registered September 20th. Capital, £1,000 in £1 shares. Objects: To carry on the business of wholesale and retail dealers in wireless instruments and accessories, home talking equipment, television and sound producing machines, electrical stores, &c. The permanent directors are: John O. S. Thomas and Wm. J. T. Thomas, both of 7, Blenheim Avenue, Southampton. Solicitors Sharp, Harrison, Turner & Co., Southampton.

Andrew, Son & Ballard, Ltd.—Private company. Registered September 20th. Capital, £200 in £1 shares. Objects: To acquire the business of an electrical engineer carried on by R. H. N. Andrew, trading as "Andrew & Son" at 46, Nimrod Road, Streatham, S.W.16. The directors are: R. H. N. Andrew (chairman), 46, Nimrod Road, Streatham, S.W.16; W. A. A. Ballard (managing director), 109, Gleneagle Road, S.W.16. Secretary: R. H. J. Andrew. Registered office: 43, Streatham Hill, S.W.2.

Wolsey (Radio & Allied Trades) Wholesale, Ltd.—Private company. Registered September 21st. Capital, £5,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in electrical and mechanical appliances, gramophones, records, musical and scientific instruments, wireless apparatus, &c. The subscribers are: William Wolsey, 169, Queen's Road, N.4, as the first director. Registered office: 54, Lamb's Conduit Street, W.C.1.

Pemberton & Sturgess, Ltd.—Private company. Registered August 31st. Capital, £100 in £1 shares. Objects: To carry on the business of electricians, mechanical and scientific engineers and manufacturers, &c. The directors are: S. N. Pemberton, 93, Village Way, Pinner, and A. T. Sturgess, 45, Grove Road, Sutton, Surrey. Registered office: 14, Gloucester Road, S.W.7.

Bevan's Radio Supplies, Ltd.—Private company. Registered September 1st. Capital, £100 in £1 shares. Objects: To acquire the business of a radio supplier and wireless and electrical engineer, carried on by E. E. T. Bevan as "Bevan's Radio Supplies," at 43, Eden Grove, Northville, and 43, Lower Ashley Road, Bristol. The permanent directors are: E. E. T. Bevan and Mary P. Bevan, both of 43, Eden Grove, Northville, Bristol, 7. Registered office: 43, Eden Grove, Northville, Bristol, 7.

Harris & Lawson, Ltd.—Private company. Registered September 14th. Capital, £100 in £1 shares. Objects: To acquire the business of radio engineers carried on by Gordon Harris and Albert L. Lawson as "Harris & Lawson" at 721, Fishponds Road, Fishponds, Bristol. The permanent directors are: Gordon Harris, 265, Forest Road, Fishponds, Bristol; and Albert L. Lawson, 245, Lodge Causeway, Fishponds, Bristol. Registered office: 721, Fishponds Road, Fishponds, Bristol.

Caradio Services, Ltd.—Private company. Registered September 22nd. Capital, £500 in £1 shares. Objects: To carry on the business of proprietors of motor and radio service stations, motor, electrical, wireless, mechanical and general engineers, &c. The permanent directors are: S. E. White, 43, Parkfield Road, Liverpool, radio engineer; and A. E. A. Shuter, 18, Carnforth Road, Streatham Common, S.W.16.

Stanley Automatic Machine Co., Ltd.—Private company. Registered September 21st. Capital, £500 in 200 preference and 300 ordinary shares of £1 each. Objects: To acquire the business of an electrical and mechanical engineer now carried on by Stanley Eaton at Renshaw Street, Liverpool. The subscribers are: S. Eaton, 39, Stalbridge Avenue, Liverpool; and J. A. Grant, 17, Douglas Road, Anfield, Liverpool. S. Eaton is the first director. Solicitors: Thomas O. Ward, Wellington Buildings, Strand, Liverpool.

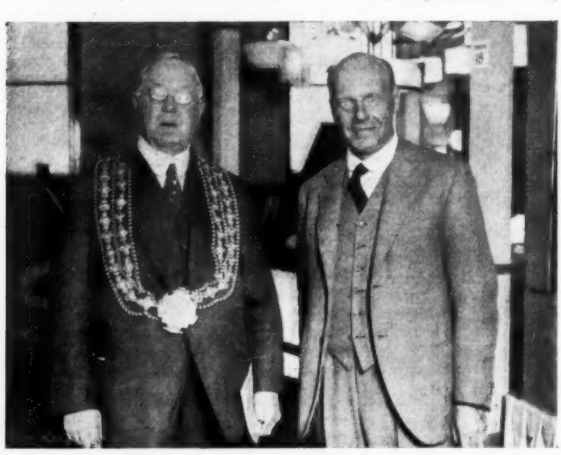
Returns of Electrical Companies

Simpsons Electricals, Ltd.—Particulars filed of £1,488 12s. 5d. debentures, authorised September 8th, 1933, charged on the company's property, present and future, including uncalled capital (subject to first and second debentures), the whole amount being now issued.

A. Hastings, Sheperdene, Kenver Avenue, N.12, ceased to act as receiver and manager on August 10th.

The Halifax Electrical Exhibition

AN electrical exhibition, promoted by the Halifax Corporation Electricity Department, with the support of local electrical contractors and a number of leading manufacturers, was opened at the Marlborough Hall, on September 20th, by Sir John Brooke, vice-chairman of the Electricity Commission,



Sir John Brooke with the Mayor at the opening of the Halifax electrical exhibition

under the chairmanship of the Mayor of Halifax (Alderman W. Crabtree). Among those present were Alderman T. Hey, chairman of the Electricity Committee, and Mr. E. A. Mills (general manager of the Halifax undertaking). The show remains open until to-morrow (Saturday). Sir John Brooke, declaring the exhibition open, said it was clear that Halifax recognised fully that by selling electricity cheaply they would get more users and larger consumption and thereby cheapen and facilitate the whole service. Electricity had withstood all the difficulties of the great depression because of its wide scope. Whilst the industry had lost business in the heavily depressed industries, other users, especially domestic, had increased to such an extent that the total output had increased.

Even in the period of the greatest depression, 1921-22, the electricity output had increased by 5.3 per cent. and sales by 4.7 per cent. In that same period the Halifax electricity undertaking had increased its own local sales by 5.8 per cent., and last year the increase was 9 per cent. If the tramways were excluded from the figures the undertaking's increase was no less than 14 per cent. In Halifax there had been little in the way of mushroom growth of suburbs and more electricity had been sold without a very great increase in the potential number of consumers. He could not understand why there seemed to be so comparatively small a use of the Corporation's assisted wiring scheme. Electricity offered the average household, by means of such a scheme, a whole range of equipment which could not possibly be available to working people if they had to put down a large sum of immediate capital. Domestic appliances of all kinds are on view, and there is also a good display of small industrial apparatus. Many well-known electrical manufacturers were represented, including the following:

Bastian & Allen, Ltd.; Belling & Co.; Berry's Electric, Ltd.; Geo. Bray & Co., Ltd.; British Hanovia Quartz Lamp Co., Ltd.; British Thomson-Houston Co., Ltd.; Bulpitt & Sons, Ltd.; Burnley Components, Ltd.; W. Canning & Co., Ltd.; Carron Company; Edison Swan Electric Co., Ltd.; Electric Fires, Ltd.; Falk, Stadelmann & Co., Ltd.; Ferranti, Ltd.; Frigidaire, Ltd.; General Electric Co., Ltd.; Hague & McKenzie, Ltd.; Hailwood & Ackroyd, Ltd.; Hoover, Ltd.; Hotpoint Electric Appliance Co., Ltd.; Kent Dish Washing Machine Co., Ltd.; Archibald Low & Sons, Ltd.; Metropolitan-Vickers Electrical Co., Ltd.; Nash & Hull; Radiovisor Parent, Ltd.; Revo Electric Co., Ltd.; Santon, Ltd.; and Vacuums, Ltd.

Fred Dawson & Co., Ltd.—J. P. Wardale, Hepper House, Leeds, ceased to act as receiver on September 12th, 1933.

Macinlop (South Africa), Ltd.—Capital, £5,000 in £1 shares. Return dated May 24th, 1933. All shares taken up. £5,000 paid. Mortgages and charges, nil.

Brush Electrical Engineering Co., Ltd.—Capital, £600,000 in 476,401 shares of £1 and 29,663,760 shares of 1d. each. Return dated June 26th, 1933. 476,401 £1 shares and 2,910,190 1d. shares taken up. £327,348 0s. 10d. paid on 315,226 £1 and 2,910,190 1d. shares. £161,175 considered as paid on 161,175 £1 shares. £3 15s. calls unpaid. Mortgages and charges, £172,507.

Telephone & General Trust, Ltd.—Capital, £1,300,000 in 550,000 cumulative preference, 450,000 preferred ordinary, and 300,000 ordinary shares of £1. Return dated March 29th (filed May 2nd), 1933. 550,000 preference, 427,000 preferred ordinary, and 300,000 ordinary shares taken up. £1,200,517 6s. paid on the preference, 282,000 preferred ordinary, and 285,000 ordinary (including premiums). £160,000 considered as paid on 145,000 preferred ordinary and 15,000 ordinary. Mortgages and charges, nil.

British Carbons, Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1932 (filed April 11th, 1933). 510 shares taken up. £486 paid. £24 considered as paid. Mortgages and charges, nil. Returns of allotments made up to May 4th, 1933, show a further 279 shares allotted for cash and 66 shares allotted as fully paid.

Symondsbury Electric Lighting Co., Ltd.—Capital, £2,000 in £5 shares. Return dated May 2nd, 1933. 244 shares taken up. £1,220 paid. Mortgages and charges, nil.

Rees Roturbo Manufacturing Co., Ltd.—J. W. Molyneux, C.A., 49, Queen Street, Wolverhampton, was appointed receiver on September 16th, 1933, under powers contained in debenture dated December 21st, 1926.

Hendon Electric Supply Co., Ltd.—Satisfaction to the extent of £5,000 on July 31st, 1933, of trust deed dated February 23rd, 1928, and acknowledgment of indebtedness dated January 12th, 1931 (supplemental thereto) and registered February 29th, 1928, and January 22nd, 1931, respectively. (According to the register of mortgages, the trust deed registered February 29th, 1928, and the acknowledgment of indebtedness registered January 22nd, 1931, originally secured £250,000 debenture stock.)

Urban Electric Supply Co., Ltd.—Capital, £1,050,000 in 700,000 ordinary and 350,000 preference shares of £1 each. Return dated June 1st, 1933. All shares taken up. £675,025 paid on 425,025 ordinary and 250,000 preference shares, £374,975 considered as paid on 274,975 ordinary and 100,000 preference shares. Mortgages and charges, nil.

Portland Products, Ltd.—H. Morgan, 54, New Broad Street, E.C., was appointed receiver on August 22nd, 1933, under powers contained in debenture dated July 31st, 1933.

Central Radio (Eastbourne), Ltd.—Capital, £500 in £1 shares. Return dated March 30th, 1933. 112 shares taken up. £112 paid. Mortgages and charges: £1,050.

J. Barber, wireless dealer, 38, Shoobridge Street, Leek.—Trustee, Mr. P. M. Milward, 12, Lonsdale Street, Stoke-on-Trent, Official Receiver, released July 5th.

Hedingham Radio, Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated August 16th, 1933, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

Leader-Way, Ltd.—Particulars filed of £2,000 debentures authorised August 10th, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Cifel Products, Ltd.—Ernest A. Shock, of 34, London Wall, E.C.2, was appointed receiver on September 4th, 1933, under powers contained in debenture dated July 24th, 1933.

Flinders (Wholesale), Ltd.—Satisfaction to the extent of £1,303 on June 24th, 1933, of second mortgage debenture stock authorised November 23rd, 1932, and registered December 2nd, 1932. (According to the register of mortgages, the debenture stock registered December 2nd, 1932, originally secured £15,000.)

A. Pank & Son, Ltd.—Two charges (1) on freehold premises next the Cattle Market, Norwich, and (2) on 8, 10 and 12, Bedford Street, Norwich, both dated August 22nd, 1933, to secure £2,800 and £2,500 respectively. Holders: A. Pank, 23, Grove Walk, Norwich, and A. R. Pank, 403, Unthank Road, Norwich.

Charles Mickleburgh, Ltd.—Capital, £100 in £1 shares. Return dated May 4th, 1933. All shares taken up. £100 considered as paid. Mortgages and charges: £1,000.

Rolls-Caydon, Ltd.—C. Latham, 78, New Oxford Street, W.C.1, ceased to act as receiver and/or manager on September 11th, 1933.

Supra Electra Motors, Ltd.—Issue on August 31st of £200 debentures, part of a series already registered.

Electrical Power Fitting Co., Ltd.—Capital, £500 in £1 shares. Return dated April 8th, 1933. 305 shares taken up. £218 3s. 10d. paid (£1 per share, less £86 16s. 10d. calls unpaid). Mortgages and charges, nil.

British Resistor Co., Ltd.—Capital, £16,000 in 15,000 6 per cent. cumulative preference shares of £1 and 20,000 ordinary shares of 1s. Return dated March 4th, 1933. 3,000 preference and 2,222 ordinary shares taken up. £3,111 2s. paid. Mortgages and charges, nil.

Caersws Electric Supply Co., Ltd.—Capital, £2,300 in £1 shares. Return dated May 10th, 1933. All shares taken up. £2,300 paid. Mortgages and charges, nil.

E. & W. Shepherdson, Ltd.—Capital, £3,000 in £1 shares. Return dated April 8th, 1933. 1,450 shares taken up. £250 paid. £1,200 considered as paid. Mortgages and charges, £350.

Arthur for Wireless, Ltd.—Particulars filed of £1,000 debentures authorised August 20th, 1933, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £400.

Radialaddin (Branches), Ltd.—Particulars filed on September 13th of debentures not exceeding £4,000 authorised on June 29th, 1933, charged on the company's property, present and future, including uncalled capital, the amount of the present issue being £1,000.

Trent Valley and High Peak Electricity Co., Ltd.—Capital, £20,000 in £1 shares. Return dated May 4th, 1933. All shares taken up. £20,000 paid. Mortgages and charges, nil.

Sky Publicity, Ltd.—The nominal capital has been increased by the addition of £8,000 beyond the registered capital of £12,000. The additional capital is divided into 5,300 10 per cent. participating preference shares of £1 and 54,000 ordinary shares of 1s. each.

Supra Electra Motors, Ltd.—Issue on September 15th, 1933, of £200 debentures, part of a series already registered.

H. & K. Radio Services, Ltd.—J. C. Sherrott, 22, Basinghall Street, E.C., was appointed receiver and manager on September 2nd, 1933, under powers contained in debentures dated April 10th and May 31st, 1933.

City Notes

Companies to be Struck Off the Register.—The names of the following companies will be struck off the Register at the expiration of three months unless cause is shown to the contrary: Acme Electric Wire & Cable Co., Ltd.; Benenson Radio Co., Ltd.; Devonshire Radio Co., Ltd.; Electric Motor Maintenance & Repair Co., Ltd.; Electric Supplies & Tools Co., Ltd.; Joint Electrical Services (Southall), Ltd.; Leader Radio, Ltd.; Southwark Electric Co., Ltd.

The Montreal Light, Heat & Power Consolidated has announced a quarterly dividend of $0.37 per share on the common shares (same).

Parkinson & Cowan, Ltd., state that the dividend on the 7 per cent. preference shares for the six months ended March 31st last will be paid on September 30th.

The Calcutta Tramways Co., Ltd., has declared an interim dividend of 3 per cent., less tax, on the ordinary shares (against 2½ per cent.).

The West London & Provincial Electric & General Trust, Ltd., is maintaining the interim ordinary dividend at 1½ per cent.

The Tamworth District Electric Supply Co., Ltd., is maintaining the interim ordinary dividend at 2 per cent.

The Midland Electric Corporation for Power Distribution, Ltd., has declared an interim ordinary dividend of 3 per cent. less tax (against 2½ per cent.).

The British Aluminium Co. in announcing the half-yearly preference dividend states that it has been decided to await the full year's results before consideration of a dividend on the ordinary shares.

Akkumulatoren A.G. (Accumulator Co.).—The Berlin correspondent of the *Financial Times* reports that at the annual meeting held on September 23rd sanction was given to the payment of a dividend of 16 per cent. as compared with 12 per cent. in 1931. Originally the intention was to declare a dividend of 12 per cent. and a bonus of 10 per cent. in cash. Instead, the meeting decided that the capital of the company should be increased from Rm.20,000,000 to Rm.21,250,000. The new shares will be offered to shareholders free of cost in the proportion of one new share to each sixteen held. The report states that since the middle of 1932 the shrinkage in sales has stopped.

Erinoid, Ltd., has announced a dividend of 11½ per cent. for the year ended July 31st, as against 10 per cent. for 1931-32.

Stewarts & Lloyds, Ltd., have declared the half-yearly dividends on the 6 per cent. first preference, the 10 per cent. second preference, and the 5 per cent. third preference shares.

Stocks and Shares

TUESDAY EVENING.

THE principal nigger in the Stock Exchange hedge peers out, for the moment, from the United States. There, the situation, which has been growing more acute for some weeks past, has reached a point that looks like a crisis. If the President cannot carry his National Recovery plan successfully, its collapse will mean, so far as present indications show, a plunge into a state of affairs worse than that which prevailed before he started upon his campaign for raising prices. The position is being watched on this side with an attention that approaches anxiety, for it has an effect far beyond that of its immediate orbit, and there are very few financial interests that escape some influence, direct or indirect, of the problems connected with the fall in the value of the dollar.

Keeping Capital at Home

In one way, the uncertainties in America stand for a certain amount of advantage at home, insomuch as they compel money to stay in this country, when security is the main object of the capital required to be employed. For this reason all British investment stocks and shares are what the Stock Exchange calls "a good market." The rises in Electricity Board stocks, and in London Transport issues, are well maintained, and any stock which comes to market finds a ready welcome. It may be said that although business of the smaller order is quiet, yet, at the same time, negotiations take place that affect lines of very substantial amounts of stock. The bargains are done, seller and buyer are both satisfied, and the price of the stock in the market is left unchanged, without anybody knowing, moreover, what has happened, except the few people engaged in the transactions which take place behind the scenes, as it were, at the market prices

of the day. The long-anticipated 2½ per cent. Conversion Loan made its appearance on Tuesday evening in this week. Over-subscription of the 150 million pounds of stock is regarded as assured.

The New Issue Season

The new issue season may be said to have commenced with the beginning of autumn, the Government being early in the field with its 2½ per cent. conversion. Fresh borrowings and new issues of stocks and shares are likely to become numerous in the near future. Their advent is awaited, for once in a way, with pleasurable anticipation, so narrow has the circle become of stocks and shares which are obtainable by the investor-buyer.

Equipment and the Grid

Reflection has already been given here to the impression that, with the completion of the Grid, the companies connected with electrical equipment and manufacturing branches will experience a sensible falling-off in the volume of their orders. This idea led to a few declines in prices of some of the leading companies' shares, but that it has little foundation in fact, broad hints have already indicated. It is said in responsible quarters that the export trade is on the mend, and that there is a fair demand from abroad for heavy machinery. Not much change in prices marks this week's lists. Associated Electrical Industries ordinary have fallen to £1 on some little pressure said to originate in America. British Aluminium are weak, a fall of 2s. reducing the price to 28s. 9d. This occurred on the directors' announcement that no interim dividend would be paid on the ordinary shares. Last year the same thing happened, but apparently some people had been expecting that the company would be able to make a distribution next month in respect of the first half of its current financial year. Ferranti preference are better at 26s. 3d., on the statements made at the recent meeting. Callender's 6½ per cent. preference at 30s. are ⅛ up. General Electric ordinary fell 6d. to 44s. 6d. Amongst the lower-priced shares, India Rubber at 3s. 3d. are 6d. down. Telephone Rentals eased off a trifle to 7s. 3d., Telephone Manufacturing are steady at 4s. 6d. Philips' Incandescent Lamp Works ordinary at 46s. 3d. are 1s. 6d. lower.

Cables and Wireless

Falls have taken place in the three stocks of the Cables and Wireless group, the preference being 4 down at 77½, on disappointment felt with the monthly figures published last week. These hardly support the view that international trade is showing improvement, and, there being something of a sketchy bull account in the preference stock, the price gave way abruptly. American Telephone & Telegraph at 132½ is 2 points down. International Telephone & Telegraph fell to 13½, rallied to 15, and reacted to 14⅝. Better figures are announced in respect of the second quarter of the present year. The company, in this three months, earned an equivalent of 3 cents per share, a small enough return, certainly, but one which compares with a minus quantity last year. The Continental selling of Great Northern Telegraphs ceased, and, in consequence, the price recovered to 30½. Marconi Marines have gone back to 31s. 3d. International Automatic Telephone ordinary are 38s. 3d. xd., and the " B " deferred shares 36s.

Electricity Supply Shares

The market in the leading shares of the electricity supply companies remains very hard. Of the London issues, there are rises in Westminsters and St. James's to the common figure of 34s. Charing Cross ordinary at 34s. 6d. are 1s. 6d. to the good. In the Provincial group, amongst other rises may be mentioned Yorkshire Electrics to 47s. 6d., Midland Electric Power to 41s. 3d., Lancashires to 36s. 3d. xd. Hendons have strengthened to 54s. xd. By increasing its interim dividend from 2½ per cent. to 3 per cent., the Midland Electric Corporation attracted renewed attention to the group as a whole. Various prices were marked ex dividend on the Monday in this week. Nearly all the deductions were immediately replaced in the prices, which are thus left virtually unchanged on balance. In the miscellaneous shares, British Power and Light ordinary are harder at 20s. On the other hand, Atlas dropped to 8s. 9d. Of the Indian companies' shares, Cawnpores are better at 40s., and Madras Electrics strengthened to the same price.

Miscellaneous Matters

The flatness of Babcock & Wilcox, on the apprehension of a reduction in the dividend, brought in support with the result that the price rallied to 33s. 9d. Iron, coal, and steel shares generally are a rather better market. Rubber shares are also firmer, without so far attracting any noticeable amount of fresh business. Victoria Falls have further improved to 5½, notwithstanding talk of labour trouble on the Rand. In the traction group, British Electric Traction deferred at 400 shows a relapse of 15. Anglo-Argentine Tramways are dull, in spite of the better tendency that has occurred in Argentine stocks on the impression that the Anglo-Argentine Supplementary Pact is on the point of being signed.

Amongst the dollar descriptions, Brazilian Tractions, after being down to 13¼, recovered to 13⅜. Other dollar stocks have been erratic, and prices have undergone fairly sharp fluctuations. These left Shawinigans at 18, and Power Corporation of Canada at 8¼.

Share List of Electrical Companies

	Nom.	Approx. Dividend. 1931.	1932.	Price, Sept. 26.	Rise or Fall.	Yield. p.c. £ s. d.
Home Electricity Companies.						
Bournemouth and Poole	1	15	15	77/6	—	3 17 1
Brompton Ordinary	1	8½	7	33/–	—	4 4 10
Charing Cross Ordinary	1	8½	7	34/6	+1/6	4 1 2
Chelsea	1	8¾	7	32/6	—	4 6 2
City of London	1	10	10	33/9	—	4 3 0
Clyde Valley	1	7	7	38/3xd.	+6d.	3 13 8
County of London	1	10½	10½	55/9xd.	+6d.	3 15 1
Edmundson's 7% Pref.	1	7	7	35/–	—	4 4 10
Elec. Dis. Yorkshire	1	9	9	48/9	—	3 13 9
Elec. Supply Corporation	1	11	11	77/6xd.	+9d.	2 16 8
Kensington Ordinary	1	8	7	38/6	—	4 3 7
Lancs Light and Power	1	7	7	36/3xd.	+9d.	3 17 2
London Electric	1	9	7	33/–	—	4 4 10
Metropolitan	1	10	10	51/3	—	3 18 2
Midland Counties	1	7	7	36/3	—	3 17 5
Mid. Elec. Power	1	8	8	41/3	+⅛	3 17 8
North Eastern Electric Ordinary	1	6	6	32/6xd.	+6d.	3 13 10
Do. 7% Pref.	1	7	7	35/–xd.	+6d.	4 4 10
Northampton	1	10	10	53/3	—	3 15 0
Notting Hill 6% Pref.	10	6	6	13½	—	4 12 4
North Met. Elec. 6% Pref.	1	6	6	30/–	+6d.	4 0 0
St. James' and Pall Mall	1	8	7	34/–	+1/–	4 2 4
Scottish Power	1	8	8	40/–	—	4 0 0
South London	1	8½	7	33/–xd.	+6d.	4 4 10
Westminster Ordinary	1	8½	7	34/–	+6d.	4 2 4
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	21/3xd.	+6d.	7 1 2
Yorkshire Elec.	1	8	8	47/6	+⅛	3 7 6
Public Boards.						
Central Electricity, 1950–70	Stock	5	5	112	—	4 9 1
Do. 1951–73	„	4½	4½	109	—	4 2 7
Do. 1963–93	„	—	3½	92½	—	3 15 8
London & Home Counties, 1955–75	„	4½	4½	107	—	4 4 1
London Passenger Transport, A	„	—	4½	116	—	3 17 7
Do. do. B	„	—	5	119	—	4 4 0
Do. do. C	„	—	—	84	–1	—
Telegraph and Telephones.						
American Tel. & Tel.	$100	9	9	132½xd	–2	6 15 10
Anglo-Am. Tel. Pref.	Stock	6	6	112	—	5 7 7
Do. Def.	„	1½	1½	25	—	5 5 3
Cables & Wireless 5½% Pref.	„	2¾	2¾	77½	–1	3 11 0
Do. A 7½% Ord.	„	Nil	Nil	20½	–2½	—
Do. B Ord.	„	Nil	Nil	13	–1	—
Globe Tel. and T. Ord.	10	Nil	2½	11⅝	–⅛	2 4 0
Do. do. Pref.	10	6	6	12½	+⅛	4 16 0
Great Northern Tel.	10	20	20	30	+⅛	6 13 4
Marconi-Marine	1	10	7½	31/3	—	4 16 0
Oriental Telephone Ord.	1	12	12	2½	—	*4 3 6
Home and Foreign Trams, Etc.						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	4/6	—	—
Do. do. 2nd Pref.	5	Nil	Nil	3/3	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	7½	–3	—
British Electric Traction Df. Ord.	„	5	5	500	–15	—
Do. do. Pref. Ord.	„	8	8	142½	—	5 12 3
Brazil Traction	100	—	—	13⅜	–⅛	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	102	—	4 18 0
Mexico Trams, 5% Bonds	—	5	5	27½	—	18 3 8
Mexican Light Common	100	Nil	Nil	11½	—	—
Do. 7% Pref.	100	7	7	15	—	—
Do. 1st Bonds	—	5	5	50	—	10 0 0
Victoria Falls Ord.	1	15	20	102/6	+⅛	3 18 2
Yorkshire (West Riding)	1	Nil	Nil	14/6	—	—
Manufacturing Companies.						
Assoc. Elec. Ord.	1	4	4	21/–	–⅛	4 0 0
Do. Pref.	1	8	8	30/9	—	5 4 2
Babcock & Wilcox	1	14	9	33/9	+6d.	5 6 8
British Aluminium Ord.	1	5	5	28/9	–2/–	3 9 7
British Insulated Ord.	1	15	15	71/3	—	4 2 4
Brush Ord.	Stock	Nil	Nil	37	—	—
Callender's	1	15	15	3½	—	4 16 0
Do. 6½% Pref.	1	6½	6½	30/–	+⅛	4 6 8
Crompton Parkinson Ord.	5/–	22½	—	18/3	—	6 5 7
Do. 8% Pref.	1	8	8	30/9	+⅛	5 6 8
Edison-Swan 1st Pref.	1	7½	7½	24/6	—	6 2 5
Do. 5% Deb.	Stock	5	5	102½	—	4 17 7
Electric Construction	1	Nil	Nil	8/9	—	—
Enfield Cable Ord.	1	25	25	91/3	—	5 9 8
English Electric	1	Nil	Nil	10/–	—	—
Do. do. Pref.	1	Nil	Nil	16/–	—	—
Ever Ready	5/–	35	35	29/–	—	6 0 8
Ferranti Pref.	1	7	7	26/3	+6d.	5 6 8
G.E.C. Pref.	1	6½	6½	29/6	—	4 8 2
Do. Ord.	1	8	8	44/6	–6d.	3 12 0
Henley's	1	30	30	6¾	—	4 14 4
Do. 4½% Pref.	5	4½	4½	5½	—	4 5 9
India-Rubber	1	Nil	Nil	3/3	–6d.	—
Johnson & Phillips	1	5	5	22/–	—	4 11 0
Siemens Ord.	1	7½	6½	24/6	—	5 6 0
Telegraph Construction	£1	Nil	Nil	23/9	—	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which all specifications will be printed and abridged and subsequent proceedings taken.

1931

16116. "Electric gramophone motors." Royal Motor Akt.-Ges. and A. F. Boitel. March 1st, 1932. (397877.)
17975. "Electric discharge tubes, particularly luminous gas-filled tubes." W. L. W. Schallreuter. March 11th, 1932. (397933.)
32696. "Electric signalling systems." A. F. Burgess (Temporator Co.). November 25th, 1931. (397858.)
32697. "Electrically operated indicator systems." A. F. Burgess (Temporator Co.). November 25th, 1931. (397859.)
33267. "Method and means for converting a range of electrical frequencies into a second range of electrical frequencies." G. W. Walton. December 1st, 1931. (397880.)

1932

5302. "Electrical remote control indicator installations." H. Scheidegger. February 22nd, 1932. (397865.)
5558. "Electric lamps." British Thomson-Houston Co., Ltd. February 25th, 1931. (397887.)
5611. "Electrical coupling plugs." J. A. Crabtree and B. G. Harrison. February 25th, 1932. (397873.)
6074. "Electric fires." General Electric Co., Ltd., and C. R. Duncombe. February 29th, 1932. (397902.)
6281. "Guard covers for electric lamps." E. A. Hailwood. March 2nd, 1932. (397904.)
6354. "Alternating-current supply systems for sound-transmitting installations." Electroacustic Ges. March 17th, 1931. (397910.)
6355. "Electric heating devices." Hotpoint Electric Appliance Co., Ltd., and W. J. Sims. March 2nd, 1932. (397911.)
6363. "Telephone systems." Automatic Electric Co., Ltd. March 2nd, 1931. (397912.)
6459. "Electrical measuring instruments." Evershed & Vignoles, Ltd., and C. E. Perry. March 3rd, 1932. (397918.)
6522. "Start-stop telegraph transmitters." Creed & Co., Ltd., and R. G. Griffith. March 4th, 1932. (397923.)
6627. "Radio and other high-frequency transmitters." Marconi International Marine Communication Co., Ltd., and F. P. Best. March 4th, 1932. (397930.)
6629. "Radio and similar high-frequency carrier wave systems for the transmission of television, high-speed picture telegraphy and the like." Marconi's Wireless Telegraph Co., Ltd., and N. E. Davis. March 4th, 1932. (397931.)
6630. "Electric resistances, resistance heaters, and the like." Expanded Metal Co., Ltd., E. T. Williams and S. W. Melsom. March 4th, 1932. (397932.)
6860. "Electric discharge devices." International General Electric Co., Inc. March 7th, 1931. (397939.)
6878. "Peak-voltage limiting arrangements for use in alternating current circuits such as signalling circuits." Electrical Research Products, Inc. March 19th, 1931. (397940.)
8156. "Electric circuit-breakers." General Electric Co., Ltd., H. C. Turner and A. Howarth. March 18th, 1932. (397945.)
8859. "Machine for bunching, twisting, and covering multi-stranded flexible electric cables." D. A. V. Rist. March 24th, 1932. (397947.)
8866. "Electric incandescent filament lamps." A. E. Chapman. March 24th, 1932. (397948.)
9907. "Protective arrangements for electric power transformers." General Electric Co., Ltd., and C. C. Garrard. April 6th, 1932. (397953.)
10052. "Chiming and striking means for electric and ordinary clocks." H. Wilson. April 8th, 1932. (Cognate application 16250/32.) (397955.)
11184. "Liquid-level indicators applicable to electric bushing insulators and apparatus." W. W. Triggs (Ohio Brass Co.). April 19th, 1932. (397958.)
11445. "Wireless-receiving headgear for personal wear." B. J. R. McDermottroe and W. T. Emberson. April 21st, 1932. (397959.)
11538. "Electrical connectors." F. A. Wineberg. April 22nd, 1932. (397960.)
13230. "Electric discharge devices." International General Electric Co., Inc. May 7th, 1931. (397972.)
16274. "Electric insulator." F. Morris. June 9th, 1932. (397994.)
16576. "Electric imitation fires." J. Jardine and British National Electrics, Ltd. June 11th, 1932. (397995.)
17776. "Magneto-electric machines." British Thomson-Houston Co., Ltd., L. Griffiths and W. H. Maycock. June 23rd. 1932. (397999.)
18692. "Protective circuit for direct-current loads supplied by means of gasfilled or vapour-filled rectifiers." Siemens-Schuckertwerke Akt.-Ges. June 25th, 1932. (398003.)
18992. "Protection of high-tension dynamo-electric machines." English Electric Co., Ltd., J. E. Calverley and S. E. Newman. July 5th, 1932. (398005.)
23312. "Transformers of the static type." H. G. Nicholson. November 21st, 1931. (Divided application on 5527/31.) (397856.)
23603. "Electrolytic gas generator." L. Jackson-Mellersh (Siemens & Halske Akt.-Ges.). August 23rd, 1932. (398021.)
26642. "Wiring or connection of radio or other electrical circuits." R. Scotney. September 26th, 1932. (398035.)
28209. "Burglar alarm means." F. Spratt. October 10th, 1932. (398038.)
32730. "Electric signalling and control systems." W. Horabin. November 19th, 1932. (398056.)
34892. "Electrically driven railless road vehicles with trolley current collectors." G. J. Rackham and Associated Equipment Co., Ltd. December 8th, 1932. (Addition to 380536.) (398066.)
35933. "Electric liquid-break switches." British Thomson-Houston Co., Ltd. (Allgemeine Elektricitäts Ges.) December 30th, 1932. (398075.)

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65. "Device for sparking plugs for screening the electromagnetic waves radiating from the ignition circuits of internal combustion engines." G. Steiner. January 2nd, 1932. (398076.)
1860. "Joints for electric cables." British Thomson-Houston Co., Ltd. January 19th, 1932. (398085.)
1948. "Single-pole electric couplings, particularly for high-voltage transformer leads." British Thomson-Houston Co., Ltd. January 21st, 1932. (398087.)
2603. "Manœuvre signals for use on motor vehicles or other traffic purposes." J. E. MacMillan. January 27th, 1933. (398090.)
3190. "Electric cooking devices." V. Gaberszig and F. Heresch. February 12th, 1932. (Cognate application 10911/33.) (398093.)
4137. "Means for preventing the overloading of electrically operated lifting devices." International General Electric Co., Inc. February 10th, 1932. (398095.)
5186. "Electric discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. May 30th, 1932. (398101.)
10024. "Impulse transmitters for operating automatic telephones." A. L. Myers. April 3rd, 1933. Convention date not granted.) (398122.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from September 20th:—

Osira. No. 541388. Class 8. Telegraphic and telephonic and radio-telegraphic and telephonic instruments and apparatus and parts thereof, electricity meters and measuring instruments, electrically operated cinematograph apparatus, electric lamps for scientific purposes, electrically operated speed, distance and pressure indicators, rheostats, electric signalling apparatus and accumulators and batteries not for medical purposes, &c. No. 541389. Class 13. Electric lamps (ordinary).—General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.

Ferrun, No. 543049, and Transept, No. 543286. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—Lissen, Ltd. Worple Road, Isleworth, Middlesex.

Avo. No. 542808. Class 8. Electrical measuring and testing instruments.—Automatic Coil Winding and Electrical Equipment Co., Ltd., 21, Douglas Street, S.W.1.

Philite. No. 543739. All goods in Class 8.—Philips Gloeilampenfabriek Maatschappij, Holland. (British representatives: Dicker, Pollak & Mercer, 20, Holborn, E.C.1.)

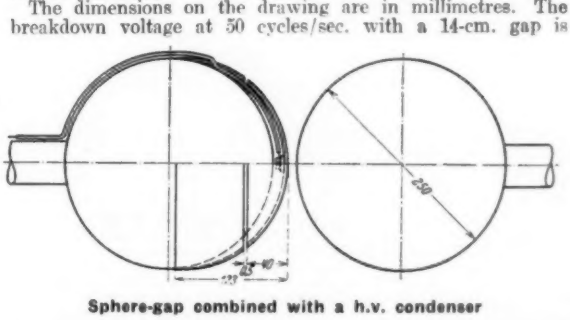
A Wise Guy (lettering and design). No. 543137. All goods in Class 8.—C. Gilbert & Co., Ltd., 75, Arundel Street, Sheffield.

Facilitating Sphere-gap Measurements

IN order to eliminate the loss of time and other objections associated with the use of sphere gaps for the measurement of high voltages, crest values may be measured by direct-reading instruments in conjunction with half-wave rectification of the charging current of a condenser. A condenser for this purpose may consist of the upper sphere of a sphere-gap, the lower sphere being replaced by a hemisphere containing an insulating segment. This combination, however, cannot be used for ordinary sphere-gap tests, hence it is necessary also to provide a regulation pair of spheres. Apart from the expense of practically duplicating this equipment, valuable space is required for its accommodation.

These objections are overcome by combining the normal sphere gap with a high-voltage condenser as shown in the accompanying illustration from a paper by W. Holzer and P. Hochhäusler in *Elektrotechnische Zeitschrift*. The sphere gap itself is of standard construction. To convert it for use as a measuring condenser, a hemisphere is placed on the lower sphere. The cap or segment of this hemisphere, which serves as the electrode of the measuring condenser, is provided with a small, screened, highly insulated cable to carry the charging current. With the condenser attachment in place, the apparatus can be used for crest or r.m.s. measurements or for oscillographic purposes; and, by removing the attachment, the spheres can be used for breakdown measurements. The same regulating rods can be used to vary the length of the gap or the capacity of the condenser.

The dimensions on the drawing are in millimetres. The breakdown voltage at 50 cycles/sec. with a 14-cm. gap is



Sphere-gap combined with a h.v. condenser

301.5 kV (max.) sphere-to-sphere, and 292.5 kV (max.) sphere-to-cap. The capacity sphere-to-cap ranges from 5.23 $\mu\mu$F with a 2-cm. gap to 1.46 $\mu\mu$F with a 14-cm. gap. The arrangement illustrated can be employed for measurements up to 250 kV (max.).

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberystwyth.—Administrative block, &c., National Library of Wales; E. C. Pinks, architect, Parliament Mansions, Victoria Street, Westminster, London, S.W.

Atherstone (WARWICKSHIRE).—Extensions to factory premises, Denham & Hargrave, Ltd.

Baillieston (LANARKSHIRE).—Houses (44); P. C. Smith, architect, 13, Clydesdale Street, Hamilton.

Birmingham.—Maisonnettes (304), The Sycamores Estate, Little Bromwich; H. H. Humphries, city architect, Council House. Presbyterian Church of England, Holly Lane and Orphanage Road, Erdington, for Rev. W. S. Ferrie, 14, York Road, Erdington; W. Darby & Son, builders, Tew Park Road, Handsworth. Cinema, corner of Hagley Road and Wolverhampton Road, for J. M. McIntosh, with electrical work; Hurley Robinson, architect, Cadogan Chambers, 6, Cherry Street. Garage, Beak Street, for Central Motor Co., John Bright Street (£6,000), with electrical work; Jones & Garfield, builders, 30, Birchfield Road. School, Glebe Farm Estate, with electrical work; Thos. Lowe & Sons, builders, Curzon Street, Burton-on-Trent.

Bolton.—Houses (60), Ferns Estate, Tudor Avenue; Estate Co.

Brentwood (ESSEX).—Church, Ongar Road, for St. Thomas Church; Crow & Careless, architects, 2, Garden Court, London, E.C.4.

Chesterfield.—Houses (645); R.D.C. surveyor.

Croydon.—Houses (500), and ward block and nurses' home, Mayday Hospital; borough engineer. Houses (20), Devisdon Road; Houselands, Ltd. Houses (56), and flats, Old Town (£30,265); H. Newby, Ltd., Ramsgate. Houses (34), Rockhampton Road; F. T. Wooding & Sons. Houses (120), Therapia Lane; Wates, Ltd. School, Waddon, for Borough E.C.; director of education. Extensions, poor law institution (£59,000); R. Mansel, Ltd., & Fretwell Engineering Co.

Darlington.—Houses, Wylam Avenue and Locomotive Street, for J. W. Richardson, builder, Quebec Street. Houses (22), Yarm Road; Boddy & Lawson, builders.

Dorking.—Houses (65); U.D.C. surveyor.

Dudley.—Houses (760); borough engineer. Shops, Priory Estate; Wm. Cooper & Son and Henry Boot & Son, Ltd.

Dumfries.—Swimming baths; burgh surveyor.

Edinburgh.—Houses (20), West Saville Terrace; D. Alexander, builders, 5a, Salisbury Road. Branch bank, Drum Street, Gilmerton, for the Royal Bank of Scotland, 98, Buchanan Street, Glasgow. C.I. Alterations to Spylaw Park House, Colinton; E. J. MacRae, city architect, City Chambers.

Faversham.—Estate development for houses, Mount Field; E. Pover & Sons, architects, Park Road.

Feltham.—Estate development, Hanworth Road and Hounslow Road; New Ideal Homesteads, Ltd., Ideal House, Carlton Road, Erith.

Filey.—Showroom store and workshop, Mitford Street, for Wright & Fearon; B. Fell & Sons, builders, Granville Road.

Gosport.—Houses (80); borough surveyor.

Halifax.—Houses (30); R.D.C. surveyor.

Hawarden.—Houses (96); Alun Edwards, Caergwrle, builders.

High Bonnybridge (STIRLINGSHIRE).—Church, for St. Helen's Church of Scotland; Wilson & Tait, architects, Grangemouth.

Hornchurch (ESSEX).—Development of Wyebridge Estate, for houses; Richard Costain, Ltd., builders.

Hungerford.—Houses (22); R.D.C. surveyor.

Hyde.—Dairy for the Co-operative Society, Ltd., Market Place; Fowden Mottram & Smith, builders, Union Street.

Kent.—Senior school, West Wickham, for County E.C.; T. Salter Davies, director of education, Sessions House, Maidstone.

Kidderminster.—Extensions, Dixon Street; Carpet Trades, Ltd.

Kilmarnock.—Houses (300); burgh surveyor.

Lancashire.—School, Tyldesley, alterations and additions to Elliot Street School, County E.C.; Stephen Wilkinson, architect, 16, Ribblesdale Place, Preston.

Leeds.—School, New York Road, for St. Patrick's, for Rev. Father P. Vermeire; Empsall, Clarkson & Clarke, architects, Permanent Chambers, Piece Hall Yard, Bradford.

Lichfield.—Houses (13); R. T. Rix & Son, builders, Shenstone Woodend.

Liverpool.—Buildings, Laurence Road, Wavertree, for the proprietors of the Lune Laundry; Joshua Henshaw & Sons, builders, 10, Chatham Street.

London.—(FULHAM).—Alterations and additions to frontage to cinema, North End Road; Brewer, Smith & Brewer, architects, 11, The Green, Richmond. (GREENWICH).—Houses (108) and flats, and infant welfare centre (£2,300); borough engineer. (STOKE NEWINGTON).—Flats and business premises, Ivy House and Stoke House, Church Street; A. J. King, Ltd. Flats, Lordship Terrace Road (£45,550); Rowley Bros., Ltd., Tottenham, N. (TOTTENHAM).—Houses (80), Craven Park Estate; S. Clifford Tee & Gale. Houses (142), Weir Hall Estate; U.D.C. surveyor. Factory extensions, 40, Braemar Road; Atlas Fur Dyers, Ltd. Factory, Crown Road; E. Barber & Co., Ltd. Factory, Philip Lane; Leiberman & Harding, Ltd. Buildings at the corner of Langham Road and Westbury Avenue; Mr. Humphries, architect. Extensions, 744, High Road; London Co-operative Society. Rebuilding, 504-8, High Road; Marks & Spencer, Ltd. (EAST HAM).—Additions to Forest View Foundry, Forest View Road; A. Foster. (ST. PANCRAS).—Tenements (35), Bangor Wharf (£24,700); borough engineer. (WOOD GREEN).—Flats, Granville Road; C. S. Brown. Showrooms and offices, Station Road; North Metropolitan Power Supply Co. Additions to 42-4, High Road; W. A. Lewis & Partners.

Longwood.—Extensions, Firm Mills; Lunn & Kaye, architects, Milnsbridge, Huddersfield.

Lowestoft.—Houses (62); borough engineer. Extensions, Notley Road School (£5,000), for E.C.

Luton.—Extensions to works (£250,000), for the Vauxhall Motors, Ltd.; C. J. Bartlett, managing director.

Macclesfield.—Houses (140), Pownall Estate, Hurdsfield; B. Cooke, builder, Buxton Road.

Maidstone.—Garage, &c., for the Transport Department; T. F. Bunting, borough surveyor, Palace Avenue.

Manchester.—Houses (104), Bluestone Road, Romney Street, Vaughan Avenue, Lisbourne Road, Athlone Avenue, and Caledon Avenue, Moston; T. H. Hallsall, builder, 360, Cheetham Hill Road. Houses (37), Hyde Road, Clumber Road, Rufford Place and Debdale Lane; J. W. Strafford, builder, Croft Street, Gorton. Flats (320), Strangeways, for Halford Housing, Ltd. Garage for the Manchester & Salford Equitable Co-operative Society, Ltd., Downing Street; E. Fielding, resident architect, works department. Milk factory, Wythenshawe, for the Manchester and Salford Co-operative Society, Ltd.; secretary. Extensions, Ancoats Hospital, Mill Street, Ancoats, for the Board of Management; Thomas Worthington & Sons, architects, 178, Oxford Road.

Morayshire.—Administrative block, Infectious Diseases Hospital, Elgin, for the Joint County Council of Moray and Nairn; I. & W. Wittet, architects, 81, High Street, Elgin.

Netherfield (NOTTINGHAMSHIRE).—Model dairy, Westdale Lane, Gedling, for the Co-operative Society, Ltd., Victoria Road, with electrical work; the Society's architects.

Newburn-on-Tyne.—Houses (200), Throckley; J. H. Wetherley, U.D.C. surveyor, Council Offices.

Newbury.—Estate development, Newtown Road; Hall & Rowlands, Council offices (£7,000); borough engineer.

Orrell (LANCS).—Houses (44), Bell Lane; U.D.C. surveyor.

Patcham (SUSSEX).—Houses (48), Heston Avenue; Ladies Mile Estate, Ltd.

Pendlebury (LANCS).—Re-erection of factory, Engine Brow, for the Electric Winding & Doubling Co.; F. Lomax, principal.

Penrith.—Alterations to Melville House, Wordsworth Street; J. & W. Scott.

Richmond (SURREY).—Block of eleven flats, Egerton House Estate, Sheen Road; Merritts, Ltd.

Rottingdean (SUSSEX).—Houses (26), Holtview Road; W. V. Martin. Houses (24), Wick Estate; T. Addison.

Roxburghshire.—School, Hawick (£12,750); county clerk, Jedburgh.

Scarborough.—Alterations to Prices (Tailors), Ltd.'s premises; A. Davies, contractors, Horn Lane, W.3.

Sedgley.—Houses (30), Temple Street; J. Horton. Houses (100), Upper Gornal; A. E. Greenshill, builders, Providence Road, Coseley.

Shipley.—Houses (18), Moorhead Crescent; C. Houlden.

Smethwick.—Houses (220), Warley Estate; borough engineer.

Solihull.—Fire station (£2,560), with electrical work; Bateman's, architects, 19, Bennett's Hill, Birmingham.

Southend-on-Sea.—Bazaar extensions, Alexandra Street, for F. W. Woolworth & Co., Ltd., London. Shops, Arcadia Terrace, London Road, Westcliff; L. R. Ramuz, builder, 41, High Street. Houses (122), Leigh; borough surveyor.

Staines.—Extensions, Cottage Hospital, providing nurses' accommodation, kitchen and women's ward additions; Leonard Martin & E. Cecil Davies, associated architects, 17, Waterloo Place, Pall Mall, S.W.1.

Stockport.—Extensions, Charles Street Depôt, for North Western Road Car Co., Ltd.; Henry Bardsley & Sons, Ltd., builders, Booth Street.

Stockton-on-Tees.—Houses (92), near Hartburn Avenue, and slum clearance scheme; G. P. Stainsby, architect, 25, High Street.

Sunderland.—Alterations to P. Bergson & Co.'s premises, High Street; S. J. Stephenson, architect, 2, Saville Place, Newcastle-on-Tyne.

Swaffham.—Post office for H.M. Office of Works, King Charles Street, London, S.W.

Swansea.—Rebuilding of 37-8, High Street, and 80-1, Orchard Street; Llewellyns, Ltd. Reconstruction of 96-7, Mansel Street; Wallace & Weir, Ltd. Rebuilding of 38-9, Waterloo Street; Charles, Ltd.

Tanfield.—Houses, Burnopfield; U.D.C. surveyor.

Taunton.—Houses (68); F. & E. Small, builders. Houses (605); borough surveyor.

Torquay.—Additions to Palace Hotel, Babbacombe; G. W. Hands.

Troon.—Houses (20); borough surveyor.

Twickenham.—Houses (30), Hall Farm Drive; H. M. Grellier and Son, architects, Palace Chambers, Bridge Street, Westminster, S.W.1.

Tynemouth.—Houses (96), Ridges Estate; J. L. Beckett, borough engineer, Howard Street, North Shields.

Upminster (ESSEX).—Houses (37), Brook House Estate; A. J. Smith.

Waddon.—Houses (187), Croydon Corporation Estate (£62,000); Eadie & Co.

Wallingford.—Houses (20), Didcot; R.D.C. housing architect.

Wellingborough (NORTHAMPTON).—Offices, Midland Road and Cheese Lane, for the Co-operative Society, Strode Road.

Wick (CAITHNESS).—Houses (146), with electrical work; burgh surveyor, Burgh Chambers.

Windsor.—Houses (44), Vale Road and Buckland Crescent; F. P. Scott & Co., Ltd.

Wolverhampton.—Houses (43), Marston Road; Marston, Fellows, Ltd. Factory extension, Bushbury; Electric Construction Co.

Worthing.—Schools, Lyndhurst Road, for Borough E.C.; education architect.